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PLANT BREEDING ABSTRACTS

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Plant Breeding Abstracts

Vol. XXXI, No. 4

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FILE

STATISTICS

4078 Rives, M.
Sur l'analyse de la variance. I. Emploi de transformations. (**On the analysis of variance. I. The use of transformations**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1960 : **10** : 309–31.

The use of transformations in cases where variances are heterogeneous is illustrated with reference to three examples.

4079 Le Roy, H. L.
La sélection artificielle suivant des caractères quantitatifs. (**Artificial selection on the basis of quantitative characters**).
Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 225–41.

The theoretical basis of selection for quantitative characters is outlined. Genetic and environmental variances are analysed and expressions are derived for genetic and environmental correlations within a randomly mating population. Formulae are given for the calculation of an optimal selection index for the simultaneous selection of two characters, and an illustration is provided by the case of milk production and fat content of milk in cows.

4080 Lein, A.
Zur relativen Bewertung von Streuungsanteilen auf Grund der Varianzanalyse. (**On the relative evaluation of variance components on the basis of the analysis of variance**).
Züchter 1960 : **30** : p. 352.

A note is presented on the calculation of the genetic and environment components of the total variance in genetical experiments treated by analysis of variance.

4081 Martin, L.
Développement des méthodes biométriques et statistiques dans la recherche agronomique en Belgique. (**Development of biometric and statistical methods in agronomic research in Belgium**).
Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 294–304.

This brief historical account includes a survey of studies undertaken by the Bureau of Biometry which was founded in 1951 by the Institute for the Promotion of Scientific Research in Industry and Agriculture (IRSIA).

4082 Henry, J. M.
Développement des méthodes biométriques et statistiques dans la recherche agronomique au Congo belge et au Ruanda-Urundi. (**Development of biometric and statistical methods in agronomic research in the Belgian Congo and Ruanda-Urundi**).
Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 272–93.

The application of biometric and statistical methods and the choice of experimental design under the varied ecological conditions of these territories are discussed. Evidence is drawn from experiments conducted at various INÉAC [National Institute for Agronomic Study in the Congo] research stations.

4083 Sváb, J.
Módszer egysorozatos kisérletek elrendezésére és értékelésére. (**Method for the lay-out and evaluation of unreplicated experiments**).
Agrobotanika, Tápiószele 1959 : **1** : 29–53. (Mimeographed).

In the lay-out for varietal trials described, each block contains a certain number of plots with a standard which are the only replicated plots and are used in the calculation of experimental error. The total error is resolved into between-block and within-block errors by means of variance analysis. The treatment differences, which are weighted only with within-block errors, may then be determined, together with the treatment-difference error, by comparison of the treatments with the standards, with other treatments in the same block and with treatments in other blocks. The procedure for comparing the data obtained with those from other trials and other years are also explained.

4084 Konstantinov, P. N. & Plotnikov, N. I.
Cu privire la metodica experientelor de cîmp. (**On method in field experiments**).
An. Romîno-Soviet.: Ser. Agric.-Zooteh. 1960 : **14** : No. 1 : 3–11.

[Cf. XXX, 3380].*

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* Reference in square brackets are to volume and number of entry in *Plant Breeding Abstracts.*

GENETICS

4085 MATHER, K.
Genetics, pure and applied.
John Innes Inst. 1960 : Pp. 15.

The substance is given of the fifth Bateson Lecture, which was delivered at the John Innes Institute on the occasion of the Institute's jubilee celebrations.

4086 FREDERICQ, P.
Recherches sur le déterminisme génétique de la propriété Hfr chez *Escherichia coli.* **(Studies on the genetic determination of the characteristic Hfr in *E. coli*).**
CR Soc. Biol., Paris 1960 : **154** : 2146–50.

The "genetic determinant" controlling Hfr (high recombination frequency) was shown to be located at the distal end of its chromosome; the latter appears to have an open-chain type of structure.

4087 FREDERICQ, P. & GRATIA, J. P.
Recherches génétiques sur la résistance croisée au phage T1 et à colicine B chez *Escherichia coli.* **(Genetic studies on the cross resistance to phage T1 and colicin B in *E. coli*).**
CR Soc. Biol., Paris 1960 : **154** : 2150–53.

Resistance to phage T1 is accompanied by resistance to colicin B. However the converse is not necessarily true, i.e. resistance to colicin B may occur in the absence of resistance to phage T1. It was shown that colicin-B resistance is determined at three distinct loci, as compared with two of the same loci for phage-T1 resistance.

4088 FRIEDRICH-FRESKA, H.
Genetik und biochemische Genetik in den Instituten der Kaiser-Wilhelm-Gesellschaft und der Max-Planck-Gesellschaft. **(Genetics and biochemical genetics in the Institutes of the Kaiser Wilhelm Society and the Max Planck Society).**
Naturwissenschaften 1961 : **48** : 10–22.

The work reviewed includes studies of the structure and role of chromosomes in inheritance, cytoplasmic inheritance, gene action, the genetics and structure of the tobacco mosaic virus and other investigations of nucleic acid and mutations by chemical changes of nucleotides.

4089 KIMURA, M.
Optimum mutation rate and degree of dominance as determined by the principle of minimum genetic load.
J. Genet. 1960 : **57** : 21–34.

It is assumed that the spontaneous mutation rate and the average degree of dominance of deleterious mutant genes are adjusted by the accumulation of modifiers so that the total genetic load is minimized. By introducing this principle of minimum genetic load it is demonstrated that "the spontaneous mutation rate and the average degree of dominance of deleterious mutant genes may be derived theoretically from the total genetic damage and the rate of substitution of genes in horotelic evolution. The relations connecting these quantities may be expressed by a pair of equations:

$$\left.\begin{aligned} \Sigma\mu &= \frac{0{\cdot}3419E}{\bar{h}}(1 + 1{\cdot}720\bar{h} + \ldots) \\ \bar{h} &= 0{\cdot}6838\sqrt{\frac{E}{2D}}\left(1 + 1{\cdot}018\sqrt{\frac{E}{2D}} + \ldots\right) \end{aligned}\right\},$$

where $\Sigma\mu$ is the spontaneous mutation rate per gamete per generation, h is the average degree of dominance in fitness of deleterious mutant genes, D is the total mutational damage or approximately the rate of inbreeding depression in fitness per unit increase in the inbreeding coefficient and E is the rate of substitution of genes in horotelic evolution." The implication of the principle of minimum genetic load for a cyclical change in environmental conditions is discussed.

4090 CATCHESIDE, D. G.
Complementation among histidine mutants of *Neurospora crassa*.
Proc. roy. Soc. : Ser. B 1960 : **153** : 179–94.

Nearly 400 ultraviolet-induced histidine-requiring mutants were found to represent alterations at six loci. Complementation occurred among mutations at four loci. Matrices constructed to represent patterns of complementation showed several physiologically distinct types of mutant alleles to be present at each of the four loci. In the case of three loci, the matrix could be represented by a linear complementation map, in which each type of mutant was inactive with respect to one particular section. The fourth locus appeared to be exceptional, in that at least one mutant type had to be represented by two regions of inactivation in a one-dimensional map, although it could be represented by a single region in a two-dimensional map. Arguments are made in favour of the view that complementation may be interpreted in terms of the polymeric structure of enzymes. The phenomenon may be due, it is suggested, to interaction in aggregates of differently altered but homologous products, the site of interaction being in the protein forming the enzyme.

4091 LEWIS, D.
Growth and genetics of higher fungi.
Nature, Lond. 1961 : **190** : 399–400.

Contributions to a symposium organized by the British Mycological Society are summarized. The genetical problems considered were (1) the extent of gene action and transport of exogenous substances along the hyphae, (2) the genetic and possible biochemical control of the mating system, and (3) the mosaic structure of natural populations and sterility barriers. The speakers on these topics were D. Lewis, P. R. Day, R. A. Raper and J. H. Burnett.

4092 NELSON, R. R.
Evolution of sexuality and pathogenicity. II. A comparison of the pattern of sexuality in *Cochliobolus victoriae* and related species.
Phytopathology 1961 : **51** : 222–23.

"Studies on the segregation of ascospore isolates of *C. victoriae* indicate that compatibility is controlled by a single major gene locus. Of 537 monoascosporic isolates studied 264 belonged to compatibility group A and 273 to group a. Monoconidial and monoascosporic isolates exhibit marked differences in degree of compatibility, as measured by the relative frequency with which isolates fail to cross with known compatible isolates.

"The fact that *C. heterostrophus*, *C. carbonum*, *C. sativus*, and *C. victoriae* have similar compatibility and incompatibility mechanisms and exhibit interspecific fertility in most combinations suggests a related evolution at the species level." [Author's summary].

4093 FÄHNRICH, P.
Entwicklungsphysiologische und genetische Untersuchungen über die Differenzierung der Fortpflanzungsorgane an *Allomyces arbuscula* Butl. (**Investigations of the developmental physiology and genetics of the differentiation of the reproductive organs in *A. arbuscula* Butl.**).
Z. VererbLehre 1961 : **92** : 8–20.

Treatment with metabolic poisons had no effect on the differentiation of gametangia and sporangia. A gametophyte, which formed an excess of female gametangia, was selfed and some F_1 plants obtained which differed from the wild-type gametophyte in the ratio of male : female gametangia and in the arrangement and size of the gametangia. The size of the nuclei in these forms indicated that heteroploid chromosome sets may be responsible for the aberrations.

A gametophyte with deficient carotene production (CM) produced functional male gametes but the meiosporangia of CM sporophytes obtained by selfing were sterile. The cross wild type x CM gametophyte gave a sterile sporophyte, but that of the reciprocal cross was fertile. It is supposed that the mutant genome causes some differentiation in the male gamete which influences the characters of the sporophyte but this does not occur in the macrogamete.

4094 FISHER, R. A.
Possible differentiation in the wild population of *Oenothera organensis*.
Aust. J. biol. Sci. 1961 : **14** : 76–78.

"Two explanations, by Wright [IX, 1376] and the author [XXX, 943] respectively, have been suggested for the high number of self-sterility alleles observed in a very small wild population of *Oenothera organensis*. Wright's explanation depends on the possible differentiation due to isolation of a number of small subpopulations. Emerson's original data, however, provide a means of putting this proposal to a test, and it appears that the different subpopulations are not in fact genetically differentiated." [Author's summary].

4095 GIERER, A.
Molekulare Grundlagen der Vererbung. (**Molecular bases of heredity**).
Naturwissenschaften 1961 : **48** : 283–89.

This is a complete version of a paper reported briefly elsewhere [cf. 1184].

4096 WEINBERG, R.
Gene transfer and elimination in bacterial crosses with strain K–12 of *Escherichia coli*.
J. Bact. 1960 : **79** : 558–63.

Information obtained from a series of bacterial crosses involving Hayes's high frequency recombination (Hfr) strain was consistent with the concept of oriented gene transfer, proposed by Jacob and Wollman. The data also indicated the occurrence of postzygotic elimination.

4097 KAUDEWITZ, F.
Bakteriengenetik, Methoden und Ergebnisse. (**Bacterial genetics, methods and results**).
Naturwissenschaften 1961 : **48** : 276–83.

A full version is presented of a paper already summarized [cf. 1183].

Genetics of *Streptomyces* and other antibiotic-producing microorganisms.
Ann. NY Acad. Sci. 1959 : **81** : 805–1016.

4098 *Bradley, S. G., Anderson, D. L. & Jones, L. A. Genetic interactions within heterokaryons of Streptomycetes. (pp. 811–23).*

Most pairs of growth-factor dependent mutants within *Streptomyces griseus* or *S. coelicolor* interacted to form nutritionally independent recombinants. Certain combinations of *S. coelicolor* mutants however were not fertile; strain S207 was crossable with lines derived from the same wild-type strain but not with strains of different origin. The infertility was not the result of a general interstrain incompatibility since a closely related strain, S206, was crossable with all strains with which it was tested. The dissimilarity of their growth-factor requirements made it unlikely that allelism was responsible for the inability to form prototrophs. Fusion occurred between the hyphae of sterile pairs. In *S. griseus*, the recombinant phenotype was transmitted regularly by hyphal segments but the spores resembled one or the other parent. The majority of the conidiospore chains from recombinant colonies contained spores of a single type; a significant number of mixed spore chains were found however. Recombinants of *S. coelicolor* regularly produced prototrophic spores. During serial subculturing of recombinant clones of *S. coelicolor*, parental phenotypes were recovered. In crosses involving parents of different bacteriophage susceptibility, only susceptible prototrophs were recovered.

4099 *Braendle, D. H. & Szybalski, W. Heterokaryotic compatibility, metabolic cooperation and genic recombination in* Streptomyces. *(pp. 824–53).*

Published and unpublished studies by the authors on genetic interactions among Streptomycetes are surveyed. It is reported that secondary parental strains exhibiting a greatly increased frequency of heterocaryon formation were isolated from a heterocaryon of *S. fradiae.* Individual conidial chains derived from a *S. fradiae* heterocaryon were shown to consist of a mixture of both parental spore types.

In heterocaryons high neomycin productivity behaved as a dominant character over low productivity while streptomycin resistance was recessive to sensitivity; nutritional deficiencies were recessive in most cases. It is considered that heterocaryon formation between two strains may be regarded as a criterion of close taxonomic relationship.

Within heterocaryons, syncaryotic interaction was observed, with the production of stable genetic recombinants; the recombination data indicate that the diploid phase is very short. It is concluded that syncaryotic recombination is potentially useful in breeding *Streptomyces* for higher yields and in modifying the chemical structure of economically important metabolites, including antibiotics.

In the discussion that followed this paper, K. F. Gregory reported that about 50% of the auxotrophic mutants isolated by him from *S. scabies* required a reduced form of sulphur for growth; the occurrence of large numbers of parathiotrophic mutants has not previously been encountered in the Streptomycetes or the true bacteria. He also mentioned that syncaryosis and genetic recombination occur in this species.

4100 *Sermonti, G. & Spada-Sermonti, I. Genetics of* Streptomyces coelicolor. *(pp. 854–61).*

From a consideration of published data it is suggested that, in this species, rare nuclear fusions occur in the mycelium of a mixed culture; such nuclear fusions may lead to either incomplete or complete zygotes. These nuclei undergo segregation processes which are sometimes complete before the conidiation of the mixed culture, giving rise to pure recombinant colonies. In some instances the segregation process continues, or perhaps even begins, after the formation of the conidia; colonies derived from such partially or completely heterozygous conidia form a mixture of different subclones. "To complete the picture of the recombinational cycle in *S. coelicolor*, the probable occurrence of some kind of genetic instability connected with the recombination process must be envisaged."

4101 *Saito, H. & Ikeda, Y. Cytogenetic studies on* Streptomyces griseoflavus. *(pp. 862–78).*

Genetic recombination occurring in a mixed culture of two auxotrophic mutants of *S. griseoflavus* strain 142 [cf. XXIX, 3380] is attributed to the incomplete fusion of the nuclei with subsequent segregation in the heterocaryotic hypha. Evidence is presented in support of the suggestion that two sets of hereditary units are present in each conidium [cf. XXVIII, 2569]. It was not possible to detect biochemical mutants among ultraviolet-irradiated conidia by the standard replica plating technique. However, subsequent incubation on complete medium revealed a number of such mutants; this is explained on the basis of segregation delay and is regarded as further evidence in support of the diploid theory. This conclusion is also supported by the observation that revertant conidia arising from auxotrophs may be heterozygous for the reverted character. It is suggested that the single conidial nucleus observed during cytological studies duplicates without separation of the components, forming a diploid nucleus just prior to maturation; it is also considered that a small proportion of conidial nuclei may be heterozygous.

4102 *McClung, N. M. Variability in Streptomycetes. (pp. 879–86).*

A review is given of published studies relating mainly to the cytology and genetics of *Streptomyces.*

4103 *Hopwood, D. A. Linkage and the mechanism of recombination in* Streptomyces coelicolor. *(pp. 887–98).*

In *S. coelicolor* strain A3(2), fifteen markers have been located in three linkage groups containing 1, 6 and 8 loci respectively; the probable order of loci and their approximate spacings within the linkage groups are indicated. Complementary recombinant genotypes appeared to be present in equal numbers among the progeny of crosses, suggesting that genetic material is probably contributed equally by the two parents. There was no evidence of a persistent diploid stage as a precursor of recombinants in this strain.

4104 *Bailey, S. G. Mechanisms controlling variation in Streptomycetes. (pp. 899–906).*

Published studies on the dissociation of variants and the genetic composition of the conidia and the vegetative mycelium in the Streptomycetes are critically reviewed. It is considered that the auxotrophic characters studied to date have been selected preferentially or adversely on complete medium and appropriately supplemented media and that, consequently, quantitative data relying upon the behaviour of auxotrophic markers have no real significance. It is pointed out that reciprocal crosses are essential prerequisites for an understanding of genetic processes in the Streptomycetes.

4105 *Alikhanian [Alihanjan], S. I., Mindlin, S. Z., Goldat, S. U. & Vladimizov, A. V. Genetics of organisms producing tetracyclines. (pp. 914–49).*

Data are presented on induced variation (using ultraviolet and X rays and ethyleneimine) and selection in *Streptomyces rimosus* and *S. aureofaciens* and on recombinations in *S. rimosus.* The data are drawn from a number of papers which have already been summarized in *Plant Breeding Abstracts.*

4106 *Sermonti, G. Genetics of penicillin production. (pp. 950–73).*

An account of parasexual recombination in *Penicillium chrysogenum* [cf. XXV, 90] is followed by a discussion of studies by the author and others on complementation and dominance relationships between alleles controlling penicillin production [cf. XXVII, 1173], dissociation of heterocaryons and the lack of autonomous cytoplasmic control in positive mutations [cf. XXVI, 93] and segregation of heterozygous diploids [cf. XXVIII, 70 and 2407, XXIX, 4674], and of the practical applications of the parasexual cycle, including the development of lines exhibiting heterosis.

4107 *Welsch, M. Lysogenicity in Streptomycetes. (pp. 974–93).*

From numerous studies conducted during 1947–59 the following conclusions are drawn: true lysogenicity is not infrequent in Actinomycetes but must not be confused with pseudolysogenicity which is often observed in cultures that have been infected exogenously with actinophages, either virulent or derived from truly lysogenic cultures. Truly lysogenic cultures submitted to isolation give only healthy colonies showing no sign of phage infection, but produce free phage when grown in broth. The capacity of such cultures to produce the virus is maintained after an indefinite number of isolations and repeated subculturing in the absence of calcium or in the presence of phage antiserum. Lysogenic strains are resistant to the actinophage that they produce after induction. Each phage from a lysogenic strain has its characteristic host range which it retains qualitatively unchanged after passing through different hosts.

4108 MARTINI, S.
Gregor Mendel als Agronom und als Förderer der Landwirtschaft. (**Gregor Mendel as an agronomist and a benefactor of agriculture**).
Schweiz. landw. Mh. 1961 : **39** : 22–29.

A brief account of Mendel's activities is presented.

4109 BARBACKI, S.
Scientific activities of Edmund Malinowski—professor in genetics.
Genet. polon. 1960 : **1** : 183–97.

This short biography is given on the occasion of the award to Malinowski of an honorary doctorate by the College of Agriculture, Poznań. A list of Malinowski's scientific papers published during 1908–59 is appended.

4110 Brock, T. D.
Chloramphenicol.
Bact. Rev. 1961 : **25** : 32–48.

A number of genetic investigations involving chloramphenicol are reviewed. Particular reference is made to studies of the genetic basis of resistance to the compound in *Escherichia coli* 'K–12' and other organisms.

4111 Pateman, J. A. & Lee, B. T. O.
Segregation of polygenes in ordered tetrads.
Heredity 1960 : **15** : 351–61.

Previous work [XXIX, 2172] revealed that ascospore size in *Neurospora crassa* is under polygenic control. Further investigation has provided evidence of the recombination of the polygenes in question during single meiotic divisions. It has also been shown that the phenotypic effects of the polygenes were not simply additive but that a considerable amount of gene interaction occurred.

4112 Maccacaro, G. A. & Hayes, W.
Pairing interaction as a possible basis for negative interference.
Heredity 1960 : **15** : 456–57. (Abst.).

"The most plausible current theory of negative interference supposes that chromosome pairing is discontinuous and random, and that recombination occurs only within those small regions where effective pairing occurs. Thus recombination in two intervals would occur with greater than random frequency if these intervals were so close as frequently to lie within one effectively paired region. The length of such regions has been estimated, in *Aspergillus* and phage, to be of the order 10^4 double nucleotides of DNA. The unique features of conjugation in *E. coli* K–12 enable distances between loci on the chromosome of the parent to be measured in absolute terms, independently of the recombination process. A study of the correlation between recombination in two intervals, in this system, has revealed a significant degree of negative interference which extends over a region of chromosome at least 10^6 double nucleotides long. Since there is evidence that effective pairing is unlikely to be continuous over such long regions, an interaction between different, small, regions of pairing is postulated to account for the effect. An explanation is offered of some anomalies between recombination data emerging from transductional and conjugal crosses involving the same strain and genetic loci."

4113 Lhoas, P.
Mitotic haploidization by treatment of *Aspergillus niger* diploids with para-fluoro-phenylalanine.
Nature, Lond. 1961 : **190** : p. 744.

Para-fluoro-phenylalanine treatment of conidia from diploids heterozygous for colour and nutritional markers resulted in complete segregation, all possible recombinants between independent markers being obtained. This treatment is thus a valuable addition to the techniques for genetical analysis by means of mitotic segregation.

4114 Hadorn, E.
Zur Problematik der Dominanz. (**On the problem of dominance**).
Vjschr. naturf. Ges. Zürich 1959 : **104** : 227–35.

Examples from the plant and animal kingdoms are given to show how the dominance or recessiveness of a genetically determined character may be altered by (1) changes in temperature, (2) the presence of different sex hormones and (3) differences in genetic background. Also referred to are instances of a pleiotropic gene being dominant for some of the characters it governs and recessive for others. Finally, examples of concealed expression, in which the difference between a dominant homozygote and its apparently similar heterozygote may be revealed by appropriate biochemical techniques, are cited.

4115 Anagnostopoulos, C. & Crawford, I. P.
Transformation studies on the linkage of markers in the tryptophan pathway in *Bacillus subtilis*.
Proc. nat. Acad. Sci. USA 1961 : **47** : 378–90.

It is concluded that the genes controlling tryptophane synthesis in *B. subtilis* are clustered, all of those studied being linked to each other and to a histidine marker. A map constructed from the data from two and three point transformations shows the tryptophane genes to be arrayed, with one apparent exception, in order of biochemical sequence; the linked histidine marker lies outside the cluster. Certain discrepancies in the reciprocal recombination values obtained suggest that the genes examined lie near one end of a transforming particle; alternative explanations however are also discussed.

4116 LAWRENCE, C. W.
The effect of the irradiation of different stages in microsporogenesis on chiasma frequency.
Heredity 1961 : **16** : 83–89.

The effect of γ irradiation upon chiasma frequency was investigated in *Lilium longiflorum* at the Wantage Research Laboratories, Atomic Energy Research Establishment, England. Chiasma frequency was altered by irradiation at (1) the stage just prior to the onset of meiosis, (2) late zygotene-early pachytene or (3) late diplotene, exposure at (1) causing a marked drop and treatment at (2) or (3) an increase. The response to irradiation at late diplotene is interpreted as arising from a failure of terminalization, but the responses at the other two stages are considered to be true increases in crossing over. The reaction to treatment at (1), it is suggested, was due to an effect on DNA synthesis, whereas the responses to irradiation at (2) may be attributed to a more direct effect on the processes leading to chiasma formation. The data support the generally accepted view that chiasma formation occurs during pachytene.

4117 BERNINGER, E.
Note sur quelques aspects de l'hétérosis. (**A note on some aspects of heterosis**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. 1960 : **10** : 345–50.

A definition of the term heterosis is followed by a description of its manifestations and an outline of hypotheses relating to its genetic and physiological mechanisms; methods of exploiting heterosis are briefly surveyed.

4118 MACKOV, F. F. & OVEČKIN, S. K.
(**The problem of physiology and biochemistry of heterosis**).
Trud. Ukr. nauč.-issled. Inst. Rastenievodstv., Selekc. Gen. (Proc. Ukr. sci.-res. Inst. Pl. Industr., Breed. Genet.) 1959 : **4** : 167–74 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3A237 : 25–26. [Russian].

General observations are made on the physiological and biochemical basis of heterosis. It is held that excess of assimilation over catabolism is the mechanism responsible for heterosis.

4119 WADDINGTON, C. H.
Molecular biology or ultrastructural biology ?
Nature, Lond. 1961 : **190** : p. 184.

The writer expresses the view that application of the term molecular biology to the whole field of research on such entities as proteins, nucleic acids, genes, viruses, antibodies and enzymes, is inappropriate. He suggests that "ultrastructural biology" should be used instead. "Molecular biology" could be retained, if desired, to denote that aspect of ultrastructural biology dealing with the chemical and physical study of the configuration of biologically important macromolecules.

4120 TIMOFEEV-RESOVSKIJ, N. V.
(**On the mechanism of autoreproduction of elementary intracellular structures. I. On the history of the problem**).
Citologija (Cytology) 1960 : **2** : 45–56. [Russian].

The evidence for the chromosomes as the bearers of hereditary information is cited, an outline being given of the concept of N. K. Kol'cov [cf. VI, 1146] of the gene as a macromolecule, a concept later supported by studies of the mutation process, by cytogenetic, cytological, biochemical and biophysical investigations and by recent results showing the genetic role of nucleic acids. The principle of "covariant reduplication", whereby an elementary biological unit reproduces itself in identical form, in the absence of mutation, or in altered form if mutation has occurred, supplies the mechanism for Darwin's evolutionary principle of natural selection.

4121 LEUPOLD, U.
Beiträge der Mikrobiologie zur Kenntnis des Genes. (**Contributions of microbiology to the knowledge of the gene**).
Vjschr. naturf. Ges. Zürich 1960 : **105** : 334–35. (Abst.).

The topics briefly surveyed include: the **1 : 1** relation between gene and enzyme; the role of nucleic acids in transmitting genetic information; the linear structure of the gene and intragenic exchanges; and the possibility of directed induced mutation.

4122 BEADLE, G. W.
The language of the genes.
Advanc. Sci. 1961 : **17** : 511–21.

Modern conceptions of the structure and functions of the nucleic acids are discussed.

4123 HERRIOTT, R. M.
Formation of heterozygotes by annealing a mixture of transforming DNAs.
Proc. nat. Acad. Sci. USA 1961 : **47** 146–53.

"Heat denaturation of a mixture of genetically different transforming DNAs from different

stocks of *Hemophilus influenzae* followed by the annealing treatment recommended by Marmur and Lane [XXX, 3415] led to the formation of heterozygotes, physical units carrying both genetic markers. A number of possible mechanisms for their formation have been considered."
[Author's summary].

4124 HALL, B. D. & SPIEGELMAN, S.
Sequence complementarity of T2–DNA and T2–specific RNA.
Proc. nat. Acad. Sci. USA 1961 : **47** 137–46.

"Experiments are described showing specific complex formation between single-stranded T2–DNA and the RNA synthesized subsequent to infection of *E. coli* by bacteriophage T2. No such hybrid formation is observed with heterologous DNA even if it has the same over-all base composition as T2–DNA. It is concluded that T2–DNA and T2-specific RNA form hybrids because they possess complementary nucleotide sequences. The generality of the existence of complementary RNA and its possible role as a carrier of information from the genetic material to the site of protein synthesis is briefly discussed." [Authors' summary].

4125 BENZER, S.
On the topography of the genetic fine structure.
Proc. nat. Acad. Sci. USA 1961 : **47** : 403–15.

The author's method of overlapping deletions [cf. XXX, 999] is used to map point mutations in the A and B cistrons of the *r* II region of the genetic map of phage T4. Within the region, which is subdivided into 47 distinct segments, 308 sites of widely differing mutability have been identified. The distributions of spontaneous mutations and mutations induced by a number of different mutagenic substances are compared. The distribution of spontaneous mutations was nonrandom and each cistron exhibited a prominent 'hotspot' (a term used to designate a highly mutable site); the hotspots occurred at *r* 131 in cistron A and *r* 117 in cistron B. It is reported that a map of the *r* II region of the related phage T6 (Benzer, unpublished) also shows hotspots at locations corresponding to T4 sites *r* 131 and *r* 117. However, while the mutability of the first T6 site is similar to that of the corresponding T4 site, that of the second site is much lower than that of the corresponding site in T4. It is suggested that cistrons may be evolving in such a way as to eliminate the hotspots.

4126 LURIA, S. E., ADAMS, J. N. & TING, R. C.
Transduction of lactose-utilizing ability among strains of *E. coli* and *S. dysenteriae* and the properties of the transducing phage particles.
Virology 1960 : **12** : 348–90.

Transduction of the *lac*$^+$ property in strains of *Escherichia coli* 'K12' and *Shigella dysenteriae* 'Sh' by phage P1 is reported. The results of transduction by various types of ultraviolet-irradiated and untreated lysates were compared. "The results are interpreted by assuming that the transducing particles contain genetic elements with various combinations of phage genes and of bacterial genes, and that the transduction type that is obtained, by integration or by lysogenization, depends both on the ability of the transducing elements to lysogenize and on the degree of genetic homology between the donor and the recipient of the transduced bacterial genes. High genetic homology favors integration; low genetic homology hinders integration and allows detection of transductants carrying the transducing element as prophage."

4127 CAMPBELL, A.
On the mechanism of the recombinational event in the formation of transducing phages.
Virology 1960 : **11** : 339–48.

"Defective, galactose-transducing λ bacteriophages have been studied which have acquired a genetic marker by recombination with an active λ phage. The precise amount of genetic material recognizably derived from the phage has not been observed to change during the course of such recombination. Comparison with suitable control crosses allows the conclusion that the transduction phage does not arise by equational recombination within regions of good homology between phage and host."
[Author's summary].

4128 WATANABE, T. & FUKASAWA, T.
Episome-mediated transfer of drug resistance in Enterobacteriaceae. I. Transfer of resistance factors by conjugation.
J. Bact. 1961 : **81** : 669–78.

"Transfer of resistance from naturally occurring multiply drug-resistant Shigellae to *Escherichia coli*, *Salmonella typhimurium*, and *Salmonella enteritidis* was studied. All of the resistance markers (streptomycin, chloramphenicol, tetracycline and sulfonamide) were found to be transferred regardless of the transfer of host chromosomes. They were further transferred indefinitely to sensitive recipients and assumed to replicate autonomously in cytoplasm. Transfer of resistance factors required about 15 min. under optimal conditions, and the transferred resistance factors were found to be phenotypically expressed apparently before the first cell division. The frequency of transfer of resistance factors, and the levels of resistance of the cells which received resistance factors, were found to differ markedly among recipient strains." [Authors' summary].

4129 Watanabe, T. & Fukasawa, T.
Episome-mediated transfer of drug resistance in Enterobacteriaceae. II. Elimination of resistance factors with acridine dyes.
J. Bact. 1961 : **81** : 679–83.

The resistance factors of drug-resistant strains of *Shigella flexneri* 2b strain 222 and *Escherichia coli* strain CSH–2 were partly or wholly eliminated by treatment of the resistant cells with acridines. Additional evidence is thus provided for the proposed episomal location of four resistance factors in these strains [cf. 4128]. The *Sh. flexneri* strain under study appears to have, in addition, a chromosomal factor for sulphonamide resistance.

Ultraviolet irradiation of resistant cells increased the frequency of elimination of resistance factors with acridines and the frequency of transfer of resistance factors by conjugation.

4130 Lwoff, A.
The Leeuwenhoek lecture. The dynamics of viral functions.
Proc. roy. Soc. : Ser. B 1961 : **154** : 1–20.

The following are discussed: infection and development, lysogeny, viral functions as affected by mutations, interactions of cellular and viral reproductive functions at the genetic level, regulating mechanisms of the cell, bacterium and bacteriophage, and interactions between cellular and viral functions.

4131 Wilson, D. E.
The effects of ultraviolet light and ionizing radiation on the transduction of *Escherichia coli* by phage P1.
Virology 1960 : **11** : 533–46.

Transduction of the threonine and eucine markers in *E. coli* was investigated. Eight strains of *E. coli*, heterogenotic at these loci, were isolated. On the basis of differences in sensitivity to irradiation, two distinct classes of heterogenotes were recognized. The mechanism of transduction by phage P1 and certain other phages is discussed.

4132 Young, F. E. & Spizizen, J.
Physiological and genetic factors affecting transformation of *Bacillus subtilis*.
J. Bact. 1961 : **81** : 823–29.

"Transformation in *Bacillus subtilis* strain 168, from indole dependence to prototrophy, could be quantitatively correlated with irreversible uptake of deoxyribonucleic acid (DNA). Certain nutritional conditions altered quantitatively the relationship between DNA uptake and transformations. In strains of *B. subtilis* which did not sporulate readily on minimal medium (Sp$^-$), the irreversible DNA uptake and the frequency of transformation were markedly reduced. The relationship of the sporulating trait and nutritional conditions to competency was discussed". [Authors' summary].

4133 Schaeffer, P., Edgar, R. S. & Rolfe, R.
Sur l'inhibition de la transformation bactérienne par des désoxyribonucléates de compositions variées. (**The inhibition of bacterial transformation by deoxyribonucleates of varied composition**).
CR Soc. Biol., Paris 1960 : **154** : 1978–83.

Details are given of the relative activity of DNA extracts derived from nine bacterial species in inhibiting the transformation of *Hemophilus influenzae* 'Rd' by DNA from RdSm, a streptomycin-resistant mutant of *H. influenzae.*

4134 Ephrussi-Taylor, H.
L'état du DNA transformant au cours des premières phases de la transformation bactérienne. (**The state of transforming DNA during the initial phases of bacterial transformation**).
CR Soc. Biol., Paris 1960 : **154** : 1951–55.

Studies on the transformation of an aminopterin-resistant *Pneumococcus* strain by DNA isolated from a streptomycin-resistant strain showed that at the "fixation" stage a bacterial-DNA complex was formed, during which acquired DNA of high molecular weight was tightly bound to a protein component of the receptive cell. The high molecular weight was retained until the acquired DNA was released into the interior of the cell.

4135 Kohiyama, M., Saito, H. & Ikeda, Y.
Une hypothèse sur la transformation génétique chez *Bacillus subtilis*. **(A hypothesis on genetic transformation in *B. subtilis*).**
CR Soc. Biol., Paris 1960 : **154** : 1893–4.

As a result of studies on the transformation of *B. subtilis* 'S^r', the following three-stage mechanism is suggested. In the first phase, DNA forms a complex with the receptive bacteria; it is believed that the rate of transformation is governed by the rate of this phase. Next DNA penetrates the host cell and, finally, the heritable character is transferred from DNA to the receptive bacteria. Factors influencing transformation are discussed briefly [cf. XXIX, 1186].

4136 Arlett, C. F.
A system of cytoplasmic variation in *Aspergillus nidulans*.
Heredity 1960 : **15** : 377–88.

Two points of particular interest emerged from this study of cytoplasmic variation in perithecia production in *A. nidulans*. (1) Such variation was more frequent at 37° C. than at 25° C. (2) Evidence was obtained of cytoplasmic "restandardization" in the conidia, since conidial propagation imposed a limit to the range of cytoplasmic variation in sexual phenotype which could be maintained. It is suggested that induction of the variants may be explained on the basis of a possible inequality between the rate of cell division and the rate of division and distribution of cytoplasmic particles. With reference to *A. glaucus*, *A. nidulans* and *A. niger*, the evolutionary significance of degree of requirement for cytoplasmic restandardization is discussed.

(The problem of populations in higher plants).
Trud. Vsesojuzn. Inst. Rasten. (Trans. All-Un. Inst. Pl. Industr.), Leningrad 1961 : No. 1 : Pp. 151. [Russian].

4137 *Sinskaja, E. N.* (*The present position of the question of populations in higher plants*). (*pp. 3–53*).

The literature on the subject is analysed. A distinction is made between a population and an ecotype, an ecotype generally comprising several distinct populations, all adapted to a particular habitat; some populations may be separated by barriers that prevent intermixing with other populations, though the potentialities for intermixing have not been lost. Such separation is exemplified by the wild lucernes in ravines in Kazahstan and by many grass species found along river banks. When variation is clinal, it is desirable to study not one or two single characters but the whole complex of features, both morphological and physiological, that are found to characterize the populations of different localities and usually vary together. The degree to which these variations are constitutional can be determined by growing different populations under identical environmental conditions in the nursery. This was done at Krasnodar with collections of *Lallemantia rupestris* made in three different localities in Armenia, each plant being examined separately. Seed collected from all plants that flowered on the same day was mixed and sown together and the progeny studied again the following year. The plants in each group flowered almost simultaneously. Similar observations were made on collections of *Camelina sativa* and here differences of 12 to 24 days were found in the time of flowering of plants within the same group, showing this species to be more heterozygous.

The experiments of Harberd [XXVIII, 3789] are quoted in detail but are considered defective in one important respect, namely that they consider individual characters; selection operates not on characters, not even on organisms but on "supraorganismal developments, on ecoelements (groups of biotypes)". Ecoelements may exist within a single population side by side, providing the material for adaptation to changed conditions. Two populations may possess the same range of characters but these characters may be differently combined into ecoelements. The regular distribution of ecoelements is shown very clearly by the author's studies of the wild populations of *Onobrychis inermis* and *Medicago quasifalcata* in the North Caucasus. It is also important to know the proportions of the different biotypes within a population and their interrelationships. Even in self-pollinated species a certain amount of cross pollination occurs more often than has been supposed and cultivars invariably constitute complex populations; this is frequently revealed when cereal cultivars are sown at unusual times, which reveals differences in the length of the vernalization stages. This occurs even in many so-called "pure-line varieties", the properties of which may be changed by the application of selection [cf. XXIX, 1367]. Variations of a similar kind are now being revealed in apomictic plants, most of which consist not of the progeny of a single individual, as asserted by Tahtadžjan, but of a great number. That variations may occur not only in ecological adaptation but in morphological features and in chromosome number is exemplified by the species *Poa pratensis*; many variants that have been classed as distinct species such as *P. angustifolia*, *P. irrigata*, *P. alpigena* and *P. arctica* are regarded as subspecies of *P. pratensis*. Many of the forms found in natural populations are thought to have originated from crosses with other species. The influence of pollination on the offspring even in apomicts has been shown by several Mičurinist geneticists.

The importance of pollination studies has been overlooked by many investigators; it is illustrated by the work of the author and her collaborators on the wild lucernes of Dagestan. Interpollination frequently occurs between *Medicago hemicycla* and *M. glutinosa*, the hybrids comprising exclusively fertile amphiploids between the two species rather than the expected sterile triploids [cf. XXVIII, 1762]. Such hybrids can be obtained artificially by crossing with pollen mixtures, whereby natural insect pollination is closely simulated.

Methods of studying the ecotypic composition of a species are discussed. Work on sunflowers has led to the conclusion that for a full assessment of the biotypes in a population not less than 200 plants must be analysed, though the predominant biotypes can be assessed from 30 plants. They should be studied when grown under uniform conditions in pots or in the nursery and also under natural conditions in their natural habitat, where all the elements of the microclimate can be analysed together with any clines in morphological features that may be established. Biotypical differences may be revealed by altering the spacing or sowing time and by growing in different localities and in different conditions of vernalization, photoperiod and temperature. The author agrees with Clausen that population study should be based on a synthesis of genetics, ecology, comparative physiology and experimental systematics.

4138 *Sinskaja, E. N.* (*The levels of group adaptation in plant populations*). (*pp. 54–69*).

It has been shown that populations of sunflower are heterogeneous in respect of photoperiodic response and by selection continued over a number of generations it has been possible to isolate pure-breeding lines with long-day and with short-day reactions. Natural selection has acted in a similar way and created ecoelements. Even so-called "pure line" varieties have been found to be composed of different "elementary biotypes" each differing in a complex of characters such as habit, developmental rhythm, cold resistance and sometimes other features: late biotypes in cereals are in general more prostrate, darker in colour and more cold resistant. Thus the wheat Milturum 321 when sown in late autumn was uniformly procumbent, but sown in early autumn (early September) it produced only a few prostrate plants and these proved to be later in maturity and more winter hardy than the rest. When sown in early April it produced a large proportion of upright plants and these proved to be spring forms, ripening earlier than the rest and displaying less cold resistance. After two generations of selection two cultivars could be isolated from Milturum 321, one early and one late. In using such varieties as parents, it is important to select the most suitable ecoelements.

It is generally more difficult to separate spring varieties into ecoelements but it can usually be done when the right conditions are found.

When the winter wheat Krasnodarka was subjected to partial vernalization it was possible to select an alternative form, which under certain conditions separated into spring and winter forms. Separation into ecoelements in this way has been achieved in a great number of leguminous forage plants and grasses. When conditions vary progressively they may often be detected as clines, when variation is more abrupt they may separate out naturally into distinct ecotypes, as in the case of the prostrate hill form and the upright plains form of *Dactylis glomerata* in Lori in Armenia. In other cases the formation of ecotypes may be more complex and occur according to the spiral principle already enunciated [XXVI, p. 516]. An ecoelement is defined as "a group of biotypes within an ecotypic population, possessing certain common adaptive properties and to a greater or lesser extent capable of reproducing themselves from generation to generation, the existence and numerical frequency of which are regulated by selection". Selection may also operate on larger units such as ecotypes and even species or groups of species. Ecoelements may be highly uniform or may display a varying degree of polymorphism in respect of non-adaptive characters. As an ecoelement becomes established its characteristics become more and more fixed genetically and dominant in inheritance. The characters that distinguish *Agropyron intermedium* and *A. trichophorum* occur in different combinations in different populations, though on progressing from northern areas, such as Moscow and Kursk, towards the south and south-east the proportion of features characteristic of *A. trichophorum* gradually increases, this change being accompanied by an increase in drought resistance. Thus it is assumed that *A. trichophorum* has evolved from *A. intermedium* on migrating into more arid areas, by a process of selection, from an initially mixed population, of those forms whose constitution enables them to withstand drought; the features involved are pubescence and narrow, rough leaves, which tend to bend upwards and are green in colour and glaucous. Since *A. trichophorum* occupies an extensive area, and has even been divided into distinct species (*A. popovii*, *A. aucheri*) by some investigators, its separation from *A. intermedium* as a separate species is considered justified. A similar series of characters is found on passing from *Secale kuprijanovii* to the more drought-resistant *S. anatolicum*, which is also characteristic in having more deeply pigmented auricles. In both these cases the one species has evolved into the other by a quantitative change in existing characters, without the acquisition of any new character. It is an example of group adaptation, which should now be studied also at the level of larger species and of genera and families.

4139 *Sinskaja, E. N.* (*Stabilizing or analytic influence of photoperiodic treatment on the phenotypic composition of* Perilla *populations in connexion with the phenomenon of failure to flower*). (*pp. 70–84*).

Populations of cultivar 501, which had been produced by individual plant selection and under ordinary conditions appeared quite uniform, when grown in continuous light extended their flowering period to as much as 18 days; 9 and 12 hr. photoperiods had a less pronounced effect on flowering time but produced various growth anomalies in certain individuals; some of the anomalous forms remained in the vegetative phase and failed to flower. Growing in such conditions thus makes it possible to analyse a population and select out certain biotypes, the existence of which had previously been masked. These biotypes remain constant in succeeding generations and are thus hereditary. Some however show a marked sensitivity to very slight changes in growth conditions and their discovery is thought to lead very close to the limit between acquired and hereditary characters.

4140 *Sinskaja, E. N. & Borkovskaja, V. A.* (*Influence of day length and temperature on development and phenological spectra of* Lallemantia *populations*). (*pp. 85–105*).

L. rupestris and *L. peltata* exist as both winter and alternative forms; the winter forms flowered in the year of sowing when grown in continuous light without vernalization, though flowering was much delayed in some of the plants. The effect of various combinations of long and short days and different temperatures on flowering was studied in both species and the results are presented. Certain treatments revealed the existence of several biotypes, the most effective in this respect being those in which seedlings from unvernalized seed of *L. rupestris* were grown for 15 days in continuous light and then with photoperiods of 12 hr. and those in which the seedlings were grown at temperatures of 18° C. in continuous light. For *L. peltata* the most effective treatments were: (1) sowing in late spring or early summer with normal photoperiods, (2) partial vernalization and (3) growing seed from nonvernalized seed at high temperatures.

4141 **Sinskaja, E. N. & Vorob'eva, F. M.* (*Analysis of populations of winter wheat in the process of converting them into spring varieties*). (*pp. 106–40*).

A number of cultivars of winter wheat and winter rye were sown in spring in various localities in the Soviet Union. They could be divided into four groups according to the proportion of plants that came into ear. A detailed study was made of seven cultivars, five of them being derived from local wheats by individual plant selection and two of them from hybridization. All of them proved heterogeneous when subjected to partial vernalization and sown in spring, a different proportion of plants forming ears according to the length of vernalization treatment. By sowing the seed from the plants that eared it was possible to select spring or alternative forms. This was effected most easily in the variety Krasnodarka and relatively easily also in Ukrainka and Taežnica [Tajga wheat]. It is concluded that the so-called conversion of winter cereals to spring forms can be effected by selection of spring or alternative forms already present in the initial variety. The reverse conversion is more difficult as the spring varieties are less heterogeneous.

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* An extended summary of this work is on file at the Bureau.

The "converted" spring form of Krasnodarka behaved as an alternative wheat, being equal to the original winter Krasnodarka in winter sowings; in some experiments it exceeded it in yield.

When plants were grown at a temperature of 15° C. or more in continuous light, differences were observed in the degree of differentiation of the growing points, some plants being still undifferentiated while others had clearly differentiated stamens and ovary. In the "converted" plants these differences were much less pronounced.

All agricultural plants examined have proved to be complex populations of different biotypes, many of which may, it is thought, originate by mutation. Their presence is less easy to demonstrate in very early-maturing varieties but this can often be done by growing the variety in unfamiliar surroundings; in this way ecotypes may evolve as the result of selection, each ecotype consisting of a complex of eco-elements, the whole being adapted to the particular variations of climatic and edaphic conditions of a given area. This process may be accelerated in cross-fertilized plants if particular conditions of pollination occur: for example, late-flowering biotypes may find a very limited range of pollen, and this may lead to various degrees of inbreeding and hence to the segregation of a series of recessive forms.

4142 *Sinskaja, E. N.* (*The phylogeny of the cultivated sunflower*). (*pp. 141–51*).

The wild and weed forms of sunflower from North America have small heads and many branches, in which respects they show more resemblance to the ornamental sunflowers than to those cultivated today in Russia and other European countries. These are considered as the true representatives of *Helianthus annuus*, while the American forms are regarded as belonging to *H. lenticularis*; the endemic Armenian chewing sunflower is intermediate between the two in many respects and is thought to have originated independently, possibly from early ornamental forms.

When grown for the first 25–30 days in short days of 9–12 hr., most sunflower cultivars prove to be long-day plants, though some are heterogeneous, containing both long-day and short-day plants. Both *H. lenticularis* and the Armenian sunflower are long-day plants and the short-day habit is thought to have arisen in the cultivated sunflowers recently in the course of selection in southern areas for high oil content.

4143 Kojima, K.-I. & Kelleher, T. M.
Changes of mean fitness in random mating populations when epistasis and linkage are present.
Genetics 1961 : **46** : 527–40.

The above problem is analysed, assuming random mating, fitness values constant with time and two alleles per locus. "It was found that the change in mean fitness was equal to twice the variance among the marginal means of all possible gametes plus a series of correction factors for linkage disequilibria". A "high degree of breakdown of linkage disequilibrium among epistatic genes" may result in a decrease in mean fitness with time despite natural selection.

4144 Parsons, P. A.
The initial progress of new genes with viability differences between sexes and with sex linkage.
Heredity 1961 : **16** : 103–07.

Further to an earlier paper on the conditions for the establishment of a new gene [1230], the author studies here the establishment of a new gene under the two circumstances stated above. In the case of differential viability between the sexes, establishment requires overall heterozygote advantage but not necessarily heterozygote advantage within any particular sex. In the case of sex linkage, the necessity of heterozygote advantage in the homogametic sex is dependent on the relative viabilities of the genotypes in the heterogametic sex.

4145 Bettini, T. M.
La variabilità genetica delle popolazioni; origine, condizioni di equilibrio, conservazione. (**The genetic variability of populations: its origin, conditions of equilibrium and conservation**).
Ann. Fac. Sci. agrar. Univ. Napoli, Portici 1959–1960 : **25** : 1–32.

An outline of the principles of population genetics is given for the benefit of Italian readers.

4146 Lagervall, P. M.
Quantitative inheritance and dominance. II. The genic and the dominance variance under inbreeding.
Hereditas, Lund 1961 : **47** : 111–30.

The relationships that exist between estimates of genetic parameters in a randomly mating population and in inbred populations derived from it are considered. Formulae for the effects of genes are developed for (1) the case where only dominance and additive genetic effects are present and (2) where dual epistasis (epistasis involving two loci) is present as well as dominance and additive effects. It was found that the inbreeding coefficient and five genetic quantities expressed as parameters of the original randomly mating population are sufficient to describe the changes that additive genetic variance and dominance variance undergo during inbreeding when epistasis is absent. Two of these quantities are the additive genetic variance and the dominance variance, two others are functions of the gene frequencies and the dominance deviations of the homozygotes and the fifth is a function of the gene frequencies, the effect of the genes and the dominance deviations of the homozygotes. When epistasis is present, the number of specifying genetic quantities required is increased considerably. If epistasis is of the additive x additive type, however, no further quantities are required. The additive x additive epistatic variance depends itself on the inbreeding coefficient and the additive x additive variance of the randomly mating population. [Cf. 1229].

4147 LAGERVALL, P. M.
Quantitative inheritance and dominance. III. The genetic covariance of relatives in inbred populations.
Hereditas, Lund 1961 : **47** : 131–59.

"The genetic covariances of full sibs and of parent and offspring under full-sib mating are investigated. For simplicity, it is assumed that alleles at different loci are randomly combined and further that no epistasis is present. The general case with any number of loci and any number of alleles at each locus is treated.

"Fractions of the genetic covariance due to genic effects, dominance, and genic effects in one relative and dominance in the other as well as the total genetic covariance are developed. It is shown that the genic correlation equals the coefficient of relationship, if the two relatives belong to the same generations with inbreeding coefficients of either 0 or 1, or if no dominance is present, or if dominance is present and only two alleles with gene frequencies 0·5 are segregating. The dominance correlation equals the dominance coefficient of relationship under random mating, in inbred populations the correlation has a very complex structure. The total genetic covariance is found to be a function of the latent roots of the generation matrix and the same five genetic quantities that described the changes of the genic variance and the dominance variance under inbreeding, when the same restrictions as in this study apply.

"A comparison is made of the coefficients of the five genetic quantities for autosomal genes and for sex-linked genes. A bias is introduced in most instances by treating the sex-linked genes as autosomal genes, but this bias is probably negligible in most cases.

"The genetic variances between lines (covariance of full sibs) and within lines at different inbreeding levels are estimated in a few examples of one-locus cases with two alleles of different gene frequencies and with different degrees of dominance." [Author's summary].

4148 PIMENTEL, D.
Animal population regulation by the genetic feed-back mechanism.
Amer. Nat. 1961 : **95** : 65–79.

It is demonstrated that "in a herbivore-plant system, animal density influences selective pressure on plants; this selection influences genetic make-up of plant; and in turn, the genetic make-up of plant influences animal density."

4149 LEWONTIN, R. C. & KOJIMA, K.-I.
The evolutionary dynamics of complex polymorphisms.
Evolution, NY 1960 : **14** : 458–72.

The joint effects of linkage and epistasis in determining genotype fitness are considered for the case where chromosome polymorphism involves two loci. The following conclusions are drawn: "(1) Gene frequencies change toward a stable equilibrium condition which corresponds to a local maximum in mean adaptive value. This change occurs in such a way that the rate of increase of mean adaptive value is not maximum. That is, the trajectory of gene frequency changes is not the 'steepest path' on the adaptive surface. (2) In the absence of epistasis, linkage does not affect the final equilibrium of the population. (3) When epistasis is present, linkage must be fairly tight in order for there to be any effect on the final equilibrium. The amount of recombination allowed for such cases is, in general, a function of epistatic deviations. (4) If linkage is tighter than the value demanded by the magnitude of epistatic deviations, there may be permanent linkage disequilibrium of considerable magnitude, and the gene frequencies may also be affected. (5) There are some cases where a stable equilibrium is possible only with a tight linkage. Without such linkage complication, there will be no intermediate gene frequency stable equilibrium. (6) The approach to the equilibrium condition is affected by linkage irrespective of whether there is epistasis although the effect is greater when epistasis is present."

4150 ULONSKA, E.
Mutationszüchtung in moderner Schau. **(Modern aspects of mutation breeding).**
Bayer. landw. Jb. 1960 : **37** : 667–86.

The history of mutation research, types of mutation and methods for the induction of mutation are surveyed.

4151 MULLER, H. J., CARLSON, E. & SCHALET, A.
Mutation by alteration of the already existing gene.
Genetics 1961 : **46** : 213–26.

With special reference to *Drosophila*, evidence is assembled that the most prevalent type of mutation, responsible for both the whole-body mutants induced by ionizing radiation and the half-mosaics arising spontaneously from post-meiotic germ cells, consists of a permanent, heritable change in the preexisting gene. Referring to the induced whole-body type of mutation, it is considered that the seeming identity of the mutant gene throughout the body indicates that the two complementary strands of the affected chromosome in the spermatozoon are altered in an equivalent and complementary fashion. It is proposed that (1) an exchange of complementary parts occurs between the two strands of the affected chromosome, and (2) the parts exchanged consist of the pair of bases present at the affected point. It is considered that radiation may break the bonds of both bases of a nucleotide pair, thereby allowing this exchange which is here termed "rotational substitution". It is emphasized that the evidence presented should not be construed as casting doubt on the occurrence of other mutations due to errors in gene duplication.

4152 MATHER, K.
Nuclear materials and nuclear change in differentiation.
Nature, Lond. 1961 : **190** : 404–06.

Paramutational types of change, such as those described in maize by Brink [cf. 1865] and in *Sciara coprophila*, are discussed as regards their possible significance in development and differentiation. Paramutation, depending on the presence of parachromatin or "ancillary materials" in the chromosomes, may "fix" initially cytoplasmic changes, thus giving them a precision in cell heredity which purely cytoplasmic transmission cannot confer. In this way, paramutation could play an important role in development. In differentiation, paramutational alterations could however have only a "derived significance springing from and dependent on the reflexion—one might almost say crystallization—by paramutation of primary changes in the cytoplasm to which indeed differentiation must still ultimately be referred." It is further suggested that, if cytoplasmic change can bring about paramutational alterations of the chromosomes, the external environment may effect directed changes in the hereditary materials through its influence on the cytoplasm. The environmentally-induced heritable changes observed in flax by Durrant may be of this kind [XXVIII, 4468; XXIX, 973].

4153 DAY, P. R.
Mutations affecting the *A* mating type locus in *Coprinus lagopus*.
Heredity 1960 : **15** : p. 457. (Abst.).

"The *A* mating type locus of *Coprinus* controls the formation of clamp connections. Clamp bearing heterokaryons are only formed between strains with different *A* alleles. Mutations which enable a presumed haploid monokaryon to form clamp connections spontaneously were recovered from fruit bodies produced by common *A* heterokaryons. Similar mutants were also recovered among recombinants in crosses involving markers closely linked with the *A* locus. "Three out of four mutations tested are either very close to the two sub-units of the *A* locus or involve one of them. Stocks carrying them show no detectable *A* incompatability reaction and will dikaryotize all *A* tester stocks. The fourth is a mutation at an unlinked locus. The mutant gene appears to be a recessive suppressor since stocks carrying it are unable to dikaryotize common *A* tester stocks."

4154 KUBITSCHEK, H. E. & BENDIGKEIT, H. E.
Latent mutants in chemostats.
Genetics 1961 : **46** : 105–22.

A method which allows the simultaneous measurement of the concentration of latent and phenotypically-expressed bacteriophage-resistant mutants of *Escherichia coli* is described. It is demonstrated that (1) the rate of accumulation of caffeine-induced mutations is independent of the growth rate in tryptophane-limited cultures, and (2) in glucose-limited cultures, the ratio rate of induction : rate of expression of mutations is largest in the cultures which grow most slowly. From a consideration of the present and earlier evidence [cf. XXX, 3427] it is concluded that latent mutant frequencies are independent of the growth rate in continuously growing cultures but that, when a loss of latent mutants occurs, the probability of expression of a latent mutant is proportional to the growth rate.

4155 Browne, S. W. (Jun.).
A biochemical mechanism for the production of abnormal tetrad ratios.
Experientia 1961 : **17** : 175–76.

It is suggested that mutation may be caused by hydrolytic deamination of a purine or pyrimidine, and that the product may be converted back to the normal condition by interaction with normal purines. It is demonstrated *in vitro* that intimate contact between aminopurine and hydroxypurine ribosides can lead to amination of the latter and it is considered that interphase would permit the required intimacy of contact between the wild-type and mutant-gene segments. If the hypothesis is correct, then "it would seem that mutations caused by an agent especially likely to cause such a reaction (such as nitrite) might be much more susceptible to conversion than those produced by such chemicals as the epoxides or by X-rays".

4156 Ryan, F. J., Nakada, D. & Schneider, M. J.
Is DNA replication a necessary condition for spontaneous mutation ?
Z. VererbLehre 1961 : **92** : 38–41.

The possibility that a molecular turnover of DNA might be responsible for mutations occurring when no net synthesis of DNA is observed was investigated using Meselson and Stahl's density gradient centrifugation technique [cf. XXIX, 124]. N^{14} was added to the medium of a stationary phase culture of an N^{15}-substituted histidineless (h^-) mutant of *Escherichia coli* '15'. During 429 hours of histidine starvation, mutation to h^+ occurred at a constant rate. There was no residual synthesis of DNA during the early period of starvation, and at 383 hr. there was a decrease of 15%. Ultraviolet absorption photographs taken after density gradient centrifugation showed only N^{15}-DNA bands and no evidence of N^{15}–N^{14} hybrid DNA bands or N^{14}-DNA bands was obtained. This rules out the possibility of whole-molecule turnover of DNA. From a consideration of the present evidence as well as evidence from base-analogue induced mutation in *Salmonella typhimurium* [cf. 1236–7], it is suggested that, if Freese's model of mutation [cf. XXIX, 3406] is accepted, and if the mutational events under study are restricted to DNA, then spontaneous mutation may be understood on the following hypothesis. (1) A minute amount of DNA replicates but base-pairing errors occur with an unusually high frequency because, for example, of some change in the composition of the nucleotide pool. (2) Minor or selective base substitution in DNA takes place during starvation; in this way an unusual base may be incorporated into the DNA, or a normal base may be incorporated into the molecule at an unusual site.

4157 Kaplan, R. W.
Spontane Mutation von einer Monoauxotrophie zu einer anderen in einem Schritt (Auxotrophiesprungmutation). (**Spontaneous mutation of one monoauxotrophy to another in one step**).
Z. VererbLehre 1961 : **92** : 21–27.

Strain CV of *Serratia marcescens* produces spontaneously about 0·5% auxotrophic mutants. Of the 60 monoauxotrophs investigated, five mutated spontaneously to another auxotrophic state thereby losing the first requirement. For example a mutant requiring arginine mutated to one requiring niacin. These changes occurred in one step without a prototrophic intermediate. Back-mutation experiments showed that the second mutation acts as a suppressor to the first but it seems improbable that this suppression is caused by a substance accumulated as a result of the second mutation. It is suggested that the second mutant gene contributes some "information" necessary for the production of an enzyme, this "information" having been lost by the first mutation. "Information" on the specificity of an enzyme may therefore be carried by several genes.

4158 Fritz-Niggli, H.
Strahlengenetische Probleme. (**Problems in radiation genetics**).
Vjschr. naturf. Ges. Zürich 1958 : **103** : 358–59. (Abst.).

It has been shown that the mutagenic effects of radiation depend upon (1) the age of the irradiated cell, (2) whether irradiation is carried out in an atmosphere of N_2 or O_2 and (3) the quality, or hardness, of the rays. The possibility of explaining these effects as a result of chemical reactions occurring in irradiated water, such as the production of H and OH radicals and H_2O_2, is considered.

4159 Phillips, J. N. (Jun.).
Modification of mutation frequency in microorganisms. I. Preirradiation and postirradiation treatment.
Genetics 1961 : **46** : 317–22.

Studies on *Streptomyces* sp. confirmed the hypothesis [cf. XXVIII, 3709; XXIX, 3421] that purine and pyrimidine precursors of RNA, altered *in vivo* by ultraviolet (UV) irradiation, are involved as chemical intermediates in the induction of mutations. It was demonstrated that mutation frequency in *Streptomyces* may be altered by means of appropriate treatment of spores prior and subsequent to application of the mutagenic radiation. The data obtained also indicated that mutation induction occurs prior to DNA synthesis, while mutation stabilization, fixation and expression are dependent upon DNA and protein synthesis subsequent to UV irradiation.

4160 Strauss, B. & Okubo, S.
Protein synthesis and the induction of mutations in *Escherichia coli* by alkylating agents.
J. Bact. 1960 : **79** : 464–73.

Previous investigations have shown that protein synthesis, soon after ultraviolet (UV) irradiation, is required for the fixation of potential mutations [cf. XXIX, 1208 and 3421]. A comparison of the mutagenic action of UV and the alkylating agents ethyl sulphate and epichlorohydrin demonstrated that immediate protein synthesis was not essential for the establishment of mutations when either of the alkylating agents was used.

4161 Shankel, D. M. & Wyss, O.
Studies on mutations induced by nonlethal dosages of ultraviolet light.
Radiation Res. 1961 : **14** : 605–17.

"The dose range of nonlethal but mutagenic ultraviolet light has been delineated for the streptomycin-resistance locus (loci) in *E. coli* B/r. The nonlethal system described here is unique in its response to nutrition during the period of phenotypic expression and in the time required for 'fixation' or 'stabilization' of the mutant factor(s). No nutritional response occurs when the streptomycin-resistant mutants are induced by dosages of ultraviolet that are lethal to a large portion of the population.

"Preliminary investigations with chloramphenicol indicate that both protein synthesis and synthesis of other nuclear components are required for the 'fixation' and expression of part of the induced mutations. Preliminary work with metabolite analogs suggests the possibility that the numbers of mutants to be expressed may be increased or decreased by use of the appropriate analog.

"Ultraviolet light is postulated to have two mechanisms of action: It produces, perhaps by direct effect, mutants which are not modified by postirradiation nutrition, and, in addition, it produces mutants which are subject to modification by appropriate postirradiation treatment. Presumably the latter are due to an indirect effect of the irradiation."

[Authors' summary].

4162 Picci, G.
Osservazioni morfo-fisiologiche su *Agrobacterium tumefaciens* (Smith et Tow.) Conn. normale ed antibiotico-resistente. [**Morphophysiological observations on normal and antibiotic-resistant strains of *A. tumefaciens* (Smith et Tow.) Conn.**].
Ann. Fac. Agr. Pisa 1960 : **21** : 19–29.

Strains of *A. tumefaciens* resistant to a wide range of antibiotics were compared with the susceptible forms. Their cells were generally shorter, they failed to form a film on hybrid media and were less mucous and luminous in solid media; some of them also had the capacity for reducing nitrates, which is absent in the susceptible strains. No change was observed in most other biochemical properties studied nor was there any alteration in pathogenicity.

4163 Alikhanian, S. L. [Alihanjan, S. I.] & Iljina, T. S.
Mutagenic action of actinophage.
J. Genet. 1960 : **57** : 11–19.

A high frequency of mutations was induced in *Actinomyces* (*Streptomyces*) *olivaceus* 'H–6' by phages 1, 2681 and 8238; both morphological and biochemical mutants were obtained. The frequency of mutation and the mutational spectrum were specific for each phage. By culturing phage 1 in two different hosts it was demonstrated that the mutational spectrum exhibited by infected H–6 is influenced by the genetic characteristics of the host in which the phage was cultured. [Cf. 1221 and 2786].

4164 Vaharu, T.
Modification of ultraviolet-induced mutation frequency in *Neurospora crassa.*
Genetics 1961 : **46** : 247–56.

The influence of certain postirradiation treatments on the mutation frequency of a leucine-requiring mutant of *N. crassa* was found to depend on the ultraviolet (UV) dose applied. After a low UV dose (30 sec. exposure), conditions favouring protein synthesis, i.e. the addition of leucine to the medium, decreased mutation frequency, while after a high dose (60 sec. exposure), identical conditions increased mutation frequency. Addition of RNA derivatives to the postirradiation medium increased mutation frequency when the UV dose was low but had no effect when the dose was high. It is suggested that these variations in response may be caused by differences in the effect of different UV doses on cellular biochemical processes.

4165 Stančev, B. D.
(Variability of *Bacillus mesentericus* induced by the antibiotics of *Chenopodium bothrys* L.).
Mikrobiologija (Microbiology), Moskva 1961 : **30** : 56–59. [Russian].

Antibiotics from *Ch. bothrys* induced heritable changes in cultural, morphological and biochemical characteristics of *B. mesentericus.*

4166 Herčík, F. & Janovská, E.
The effect of chloramphenicol on the formation of mutations by *Serratia marcescens.*
Folia biol., Praha 1961 : **7** : 66–67.

Chloramphenicol concentrations of 30–100 μg. per ml. produced a marked increase in the frequency of mutations in a red-coloured variant of *S. marcescens*; mutation was from red to pink and white. Colonies of different colour types remained stable during eleven transfers. It is suggested that cytoplasmic factors may play an important part in the formation of mutations in this organism.

4167 Moutschen-Dahmen, J., Moutschen-Dahmen, M., Verly, W. G. & Koch, G.
Autoradiograms with tritiated myleran.
Exp. Cell Res. 1960 : **20** : 585–88.

A preliminary investigation designed to elucidate the biochemical nature of mutation in myleran-treated root-tip cells of *Vicia faba* is described. It was demonstrated that some parts of the chromosome do not react with the alkylating agent, i.e. the reaction sites of myleran are not uniformly distributed in the nucleus.

4168 Lîsenko [Lysenko], T. D.
Cu privire la problema conexiunii dintre biologie, chimie' şi fizică. **(On the problem of the connexions between biology, chemistry and physics).**
An. Romîno-Soviet. : Ser. Biol. 1960 : **14** : No. 2 : 3–8.

[Cf. 1283].

4169 Lysenko, T. D.
(Mičurinist theory—at the service of the people).
Agrobiologija (Agrobiology) 1960 : No. 3 : 323–27. [Russian].

The basic tenets of Mičurinism are briefly reviewed. The main difference between Mičurinism and its rival theories lies in the concept of heredity which the author describes as "a property of the entire living organism and any of its parts" and regards as subject to environmental influence. Belief in the existence of a specific heritable substance and in material units of inheritance is incompatible with Mičurinism. Experiments on induction of heritable changes in microorganisms by culturing strains on a substrate containing DNA of another strain can be given a Mičurinist explanation. The author also recapitulates his theory of evolution by interspecific conversion.

4170 Lysenko, T. D. & Nuždin, N. I.
(For materialism in biology).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 5–53. [Russian].

In the first two sections, by Nuždin, it is submitted that the need to propose subunits of the gene and the discovery of the activity of various cytoplasmic particles and of the transforming capacity of DNA have made the concept of the gene as the unit of inheritance untenable. Data are cited showing that the action of DNA is not as specific as might be expected. The fact that the DNA effecting transformation and transduction is absolutely free from other material remains unproven; the same objection is referred to the DNA used in virus resynthesis. Doubts expressed on this score by a number of geneticists are cited, together with reports of cases where the quantity of DNA is not correlated with chromosome number, and the conclusion that DNA is the sole material of inheritance is described as premature and metaphysical; it is also incompatible with the Mičurinist principle of the inheritance of acquired characters, the existence of which is exemplified by nutritional adaptation in microorganisms and the phenomenon of vegetative hybridization.

Sections 3–5 are reproduced from an earlier publication [cf. XXVIII, 3722–3].

4171 Pettit, L.
Current Soviet outlook on the inheritance of acquired adaptations.
Ohio J. Sci. 1961 : **61** : 147–50.

On the basis of his visit to the Soviet Union during 1958, examination of textbooks and correspondence with other scientists in the USA interested in the status of genetics in the USSR, the author concludes that, although some modifications of the views intensely hostile to 'Western genetics' have transpired, and contradictions seem to exist between professed beliefs and actual practice, the acceptance of the gene concept has not occurred in the slightest degree. In his view, Lysenko "appears to be more solidly entrenched than ever."

4172 KREMJANSKIJ, V. I.
(Discussion of philosophical problems of modern genetics).
Vopr. Fil. (Probl. Phil.) 1960 : No. 9 : 132–42 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4A283 : p. 28. [Russian].

In an historical survey of the concept heredity, three stages are envisaged. Before Weismann, Darwin, Spencer and Nägeli accepted the inheritance of acquired characters. Then came formal genetics based on Weismann and Morgan. Since 1936 formal genetics has been moving closer to Mičurinism.

4173 HALIFMAN, I. A.
Forced admissions (on the pages of biological journals).
Vopr. Fil. (Probl. Phil.) 1959 : No. 8 : 100–11 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abstr. 2A276 : p. 30. [Russian].

Western geneticists are said to be moving away steadily from Morganism towards Mičurinism, and Mani, Michie, Rostand, Ruttner and Waddington are among those cited as having made qualified admissions of the failure of formal genetics.

4174 DVORJANKIN, F. A.
(Is "classic genetics" being reformed ?)
Vopr. Fil. (Probl. Phil.) 1959 : No. 12 : 128–38 : from Ref. Ž. (Ref. J.) 1961 : No. 1 : Abst. 1A260 : p. 31. [Russian].

N. P. Dubinin, N. V. Turbin and D. F. Petrov are criticized for expounding views which in substance differ little from formal genetics. In particular they are said (1) to accept the concept of material units of inheritance, (2) to distinguish between genotype and phenotype and (3) to substitute chance mutations for inheritance of acquired characters.

4175 FOLTÝN, J.
100 let boje o darwinismus. **(100 years of conflict about Darwinism).**
Za Socialist. Zemĕd. 1959 : **9** : 1040–46.

The conflict between Mendel-Morganism and Mičurinism is discussed by a supporter of the Mičurinist school.

4176 PREZENT, I. I.
(Lenin's theory of two concepts of evolution and biological theory).
Agrobiologija (Agrobiology) 1960 : No. 2 : 163–79. [Russian].

The principle of blending, uninterrupted evolution is criticized on philosophical grounds, in particular on the basis of Lenin's dicta on the unity of continuity and discreteness. It is held that Mičurinist ideas such as shattered inheritance, phasic development and assimilation of environment are more consonant with Lenin's concept.

4177 FEDJUŠIN, A. V.
(Problems of the origin of species a hundred years after Darwin).
Trud. omsk. sel'skohozjajstv. Inst. (Proc. Omsk agric. Inst.) 1960 : **40** : 181–92 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4A113 : p. 11. [Russian].

An outline is given of Mičurinist ideas on variability, heredity and natural selection.

4178 DOLGUŠIN, D. A.
(Darwinism and plant breeding).
Agrobiologija (Agrobiology) 1960 : No. 1 : 16–26. [Russian].

Darwin's views on cross pollination, self pollination, constitutional vigour, selection and environmental effects on variability are discussed in relation to Mičurinist methods in plant breeding. Some practical examples of environmental training of wheat and barley are given, notably the outstandingly productive and winter-hardy soft wheat Mironovka 264, obtained by training the hard wheat Narodnaja [People's] for winter habit and the winter barley Odessa 16 obtained in the same way from a spring barley.

4179 ROBERTSON, A.
A theory of limits in artificial selection.
Proc. roy. Soc. : Ser. B 1960 : **153** : 234–49.

Some extensions are made to the treatment of gene frequencies under natural selection devised by Kimura [cf. XXVII, 1061], attention being restricted to single genes. The following are among the conclusions: (1) for a gene with selective advantage s, the chance of fixation is a function only of Ns, when N is the effective population size; (2) the expected limit of individual selection is a function only of $N\bar{c}$, where c is the selection differential in standard deviations; (3) for additive genes and low $N\bar{c}$, the total advance by selection is $2N$ times the gain in the first generations; (4) for recessive genes, the total advance relative to the gain in the first generation may be much higher; and (5) the half life of any selection process for additive genes will not exceed 1·4 N generations but may rise to $2N$ for rare recessives.

4180 NEURAY, G.
Étude des corrélations entre les différentes phases de la croissance et du développement du *Cyclamen persicum* Mill. (**A study of correlations between different phases of growth and development in *C. persicum* Mill.**).
Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 374–81.

The use of correlations between various growth and developmental characters as a basis for seedling selection is demonstrated; it is considered that the methods described would be suitable for the selection of plants other than cyclamen.

EVOLUTION

4181 SCHMALHAUSEN, I. I.
Evolution and cybernetics.
Evolution, NY 1960 : **14** : 509–24.

The evolutionary process is analysed from the standpoint of cybernetics [cf. 4185].

4182 ŠKOL'NIKOV, S. A.
(**Specificity of progressive evolution of organic life**).
Učen. Zap. rostov./don. pedag. Inst. (Sci. Mem. Rostov./Don. pedag. Inst.) 1959 : **2** : 146–69 : from Ref. Ž. (Ref. J.) 1961 : No. **4** : Abst. 4A111 : p. 10. [Russian].

Evolution is seen as adaptation to altering environment by divergence and establishment of divergent phyla. These have evolved according to different principles and at different tempi. Interrelations between evolving forms and environment have become increasingly complex. Continuous changes in environment and heredity of an organism make evolutionary processes irreversible. The more widely adapted species suppress those adapted to a particular environment.

4183 KUŠNER, H. S.
(**A scientific conference devoted to the great creations of Darwin and Lamarck**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. **2** : 313–16. [Russian].

At the conference, held in Moscow on 19–21 November 1959, T. D. Lysenko pointed to the positive side of Darwinism as modified by Mičurinism, which had, it was affirmed, made it possible to modify the hereditary nature of an organism in a previously defined direction. This was illustrated by the conversion of winter cereals into spring and *vice versa*, by the cultivation of oaks in clusters and by the improvement of fat content in the milk of cows. N. I. Nuždin considered the articles of A. L. Tahtadžjan and others on the random nature of hereditary changes to be an attack on the principle of the inheritance of acquired characters finally accepted by Darwin, in support of which the work of Mičurin, Durrant [cf. XXVIII, 4468], Fahmy and others was cited. I. M. Poljakov pointed to much that was acceptable in Lamarck's views and G. V. Platonov to the dialectical qualities of Darwin's ideas. N. N. Ladygina-Kots adduced evidence for a qualitative as well as quantitative difference between the minds of man and the higher animals. D. A. Dolgušin submitted that all practical breeding was based on Darwinism and never on Mendelism and mentioned various Mičurinist methods, citing the winter barley Odessa 17, produced by conversion from spring barleys, the winter bread wheat Mironovskaja 264, produced by conversion from a spring form of *Triticum durum*, sunflowers containing 52–53% of oil and varieties of various other crops, pointing out that 2500 Soviet cultivars are now cultivated, as against 163 from abroad.

4184 PORA, E. A.
Valoarea steno- și euribiozei pentru evoluție. (**The value of stenobiosis and eurybiosis for evolution**).
Stud. Cercet. Biol., Cluj 1960 : **11** : 195–200.

The author outlines the view that evolution proceeds by a dialectical alternation between eurybiotic phases, in which organisms are adapted to a wide range of environmental conditions and rapid evolutionary advance occurs, and stenobiotic phases, in which narrow adaptation leads to evolutionary stagnation.

4185 ŠMAL'GAUZEN, I. I.
(**Natural selection and information**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. **1** : 19–38. [Russian].

The population is envisaged as the unit in the evolutionary process and its relationships to the biocenosis in which it occurs are likened to a self-regulating cybernetic system incorporating a feed-back mechanism, which is operated by natural selection. The variation of the population corresponds to the amount of information; the rarity of any variant is expressed as log p, and the maximum variation (= maximum information) occurs when p = 0·368; this is styled the state of maximum entropy. When selection is severe, with s = 0·66 or over, the rate of selection of a given variant corresponds to this maximum coefficient of information, whereas with milder selection it is conditioned also by the relative frequency of the competing genotypes. This is illustrated for haploid and diploid populations respectively.

4186 BERNAL, J. D.
Significance of carbonaceous meteorites in theories on the origin of life.
Nature, Lond. 1961 : **190** : 129–31.

The significance of the hydrocarbon distribution in the high-temperature distillate of the Orgeuil carbonaceous meteorite is examined. One difficulty in the way of accepting an organic origin for the carbonaceous matter is the low phosphorus content of the meteorite. An alternative theory whereby the carbonaceous matter would have been formed by the effect of cosmic rays and solar particles on solid ice, CH_4, NH_3 and H_2S condensing out from the solar gases is put forward.

4187 BRIGGS, M. H.
The origins of life on the earth: a review of the experimental evidence.
Sci. & Cult. 1960 : **26** : 160–70.

Current views on the origin of life on the Earth are reviewed. Reasons are put forward for reconsidering the possibilities of an extraterrestrial origin. While the hypothesis of chemical evolution has much recent experimental work in its favour, the origins of enzyme proteins and of stereoisomerism lack adequate explanations.

4188 ĖFROIMSON, V. P.
(An analysis of some basic mechanisms of immunity, radiation disease and carcinogenesis from the standpoint of modern genetics).
Bjull. mosk. Obšč. Ispyt. Prirod. (Bull Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1960 : No. 6 : 109–28. [Russian].

The malarial resistance of individuals carrying the sickle-cell genes is ascribed to the biochemical specialization of the parasite, which can only survive in normal hemoglobin cells; an analogy is made with the biotypes of plant pathogens. The point of view is supported by the frequency of monohybrid or simple segregation ratios in respect of genes for resistance and by the frequent occurrence of forms of the host-plant resistant to a given biotype after irradiation. K. T. Suhorukov and his school have shown that hosts normally resistant can be made susceptible to certain parasites if they are supplied with particular nutrients.
The change of a single aminoacid in the polypeptide often suffices to block some enzyme reaction and confer immunity. The more closely the mutated product resembles the normal in all other respects, the more efficient is this type of immunity likely to be, and this is thought to account for the frequency of multiple allelism in the inheritance of enzyme reactions and of immunity. It is also thought to account for the frequency of natural antibodies in animals. The capacity of some viruses to supply nucleic acids or other materials present in limited quantities in normal cells is suggested as an explanation of their carcinogenic properties.

CYTOLOGY

ERNST-SCHWARZENBACH, M.
Zwanzigster Jahresbericht der Schweizerischen Gesellschaft für Vererbungsforschung Société Suisse de Génétique (S.S.G.). [**Twentieth Annual Report of the Swiss Society for Genetics (S.S.G.) 1960**].
Arch. Klaus.-Stift. VererbForsch. 1960 : **35** : 313–479.

4189 *Rutishauser, A. Das Verhalten zentrischer Fragmente im Endosperm von* Trillium grandiflorum. (*The behaviour of centric fragments in the endosperm of* T. grandiflorum). (*pp. 413–18*).

In addition to metaphases with 2–6 broken chromosomes, mitoses with one centric fragment were frequent in irradiated endosperm. Sister reunions were seldom observed, being most rare when only one fragment was present; their frequency decreased as the time from irradiation increased. When more than one fragment was present, chromosome reunions occurred amongst 28–36% of the broken ends. The intercentric arm of dicentric chromosomes tended to disintegrate. These results are discussed.

4190 *Rutishauser, A. Zur Genetik überzähliger Chromosomen.* (*The genetics of supernumerary chromosomes*). (*pp. 440–58*).

In this detailed review, it is shown that the B chromosomes are quite different from the A chromosomes in their physiological behaviour and often differ morphologically as well.

4191 TROŠIN, A. S.
(On the tasks of investigating the problem of "the crucial questions of cytology").
Citologija (Cytology) 1960 : **2** : 131–37. [Russian].

An outline is given of the problems on which cytologists in the Soviet Union should mainly concentrate in the next seven years. These include the role of DNA in chromosome reproduction, the interrelationships of nucleus and cytoplasm, the causes of tumour formation, questions of permeability, sensitivity and specialization and special problems concerning the nuclear apparatus and synthesis in microorganisms.

Abstracts of papers for the 9th Annual Meeting of the Radiation Research Society, Washington, D.C., May 15–17, 1961.
Radiation Res. 1961 : **14** : 445–519.

4192 *Evans, H. J. The influence of the nucleolus and heterochromatin on the frequency and distribution of radiation-induced chromatid exchanges in* Vicia faba. (*p. 464*).

"Studies on interchange and isochromatid aberrations induced in root-tip meristem cells following Co^{60} gamma irradiation, have shown that the distribution of these aberrations between and within chromosomes is non-random. The frequency with which a given chromosome undergoes exchange is not proportional to its metaphase length: this is particularly evident in the case of the two shortest pairs of chromosomes which were involved in aberrations almost twice as frequently as expected on the basis of their metaphase length. The centromeric and distal regions of the acrocentric chromosomes are rarely involved in aberrations, a significant excess of events occurring in and around the mid-chromosome regions which contain the heterochromatin. It is suggested that the association between heterochromatin and aberration frequency and distribution, follows from the enhanced probability of exchange at these regions due to the fusion of heterochromatin in the interphase nucleus. The reduced frequency of interchange and almost compensatory increase in intrachange in the nucleolar chromosome arms is thought to be due to the nucleoli, which occupy about one quarter of total nuclear volume, acting as physical barriers reducing the possibility of close spatial association or fusion between the nucleolar and other chromosome regions."

4193 *Haas, F. L., Doudney, C. O. & Kada, T. Dependence of radiation-induced auxotrophic reversion on nucleic acid synthesis.* (*pp. 471–72*).

Inhibitors blocking RNA or protein synthesis were found to decrease ultraviolet-induced reversion of tryptophane requirement in *Escherichia coli* 'WP2'; the process is termed mutation frequency decline (MFD). Potential mutations are lost through MFD unless the RNA and protein necessary for genetic replication are synthesized before inhibitor addition. Similar X-irradiation studies indicated that only about half of the induced mutations were sensitive to MFD. This proportion required RNA, DNA and protein synthesis for induction, as do ultraviolet-induced mutations. It appears that mutations susceptible to MFD require DNA replication, while the MFD-resistant mutations are induced in the parental DNA.

4194 *Helmstetter, C. E. & Uretz, R. B. Radiation sensitivity of synchronous populations of* Escherichia coli. (*pp. 474–5*).

The sensitivity to ultraviolet and X irradiation of synchronously dividing *E. coli* 'B' cultures was found to be constant except for sharp increases in sensitivity in midcycle and just prior to cell fission, within each generation.

4195 *Hill, R. F. Post-irradiation influences on UV-induced reversions in* Escherichia coli. (*p. 475*).

Incubation in saline and exposure to photoreversing light of ultraviolet (UV) irradiated *E. coli* 'WP2' are known to reduce the induction of reversions in this tryptophane-requiring strain. Both effects were found to be influenced by the UV dose; the effect of saline treatment is, in addition, influenced by the composition of the plating medium.

4196 *Latterell, R. L. The influence of oxygen on radiosensitivity of maize chromosomes during seed germination.* (*pp. 480–81*).

Seed samples of maize, heterozygous for alleles of the yg_2 locus, were exposed to X irradiation in air and in helium, after having been presoaked for varying periods of time at 27° C.; somatic sectors, representing losses of the dominant allele, provided a criterion of radiosensitivity. A 12,000 r. dose produced a comparable response in dry seeds and in seeds soaked for up to four hours in both air and helium. "Sector frequencies began to increase when seeds soaked for 4–5 hours were irradiated in air. The initial rise in sensitivity for seeds irradiated in helium appeared after 6–8 hours hydration. Both series underwent a marked (ca. 4-fold) rise in radiosensitivity between 17 and 26 hours. This latter increase coincided with the principal rise in oxygen consumption and apparently accrues to metabolic changes in embryonic cells [XXX, 1523]. The initial rise in sector frequencies (4–5 hours) was due to oxygen enhancement of aberration yield. The ratio of sectors induced in air to those induced in helium was ca. 1·2 for dry seed and seed soaked up to 4 hours, rose to ca. 2·5 by 10–12 hours, and thereafter remained constant. In this system the oxygen effect evidently is not primarily associated with the respiratory mechanism."

4197 *Mericle, L. W., Mericle, R. P. & Campbell, W. F. Use of radiation-induced isomutant-carrying sectors as ontogenetic time clocks. (p. 486).*

An example of the use of isomutant-carrying sectors, obtained by irradiation at specific stages of ontogeny, for the study of morphogenesis in barley is described.

4198 *North, D. T. & Caldecott, R. S. The relation of oxygen to the manifestation of X-ray induced interchanges and mutations in barley. (p. 490).*

Dormant barley seeds with an embryo water content of 4%, hydrated in the presence of oxygen immediately after irradiation, showed greater genetic injury (mutations and interchanges) than similarly irradiated seeds hydrated anaerobically. "The mutation frequency plotted as a function of dose was linear for both conditions of hydration. However, the number of mutations produced per unit of radiation was greater for seeds hydrated aerobically than for those hydrated anaerobically. In contrast with the mutation data, an exponential relationship between interchange frequency and dose was found following aerobic hydration, whereas anaerobic hydration resulted in a linear relationship. The results can be explained on the basis of the distribution of ion pairs along electron tracks. That is, those regions which received only a few ionizations per sensitive volume became manifest as chromosome breaks or mutations only in the presence of oxygen, whereas dense clusters of ionizations were the principal cause of genetic injury under conditions of anaerobic hydration. The explanation of these results on the basis of LET derives credence from neutron experiments where it is known that interchanges and mutations are both linearly related to dose."

4199 *Schambra, P. E. Effects of heavy ions on cellular systems relative to lightly ionizing radiation. (pp. 497–98).*

Studies on the radiosensitivity of *Escherichia coli* 'B' and haploid and diploid *Saccharomyces cerevisiae* to stripped nuclei of helium, carbon, nitrogen, oxygen, neon and argon (covering a range of linear energy transfer from 10^2 to 10^4 ev/100 Å.), as compared with the sensitivity to 1 Mev electrons and Co^{60} γ rays are reported. The results indicated that after an initial rise, relative biological effect decreased with increasing linear energy transfer.

4200 *Sparrow, A. H., Miksche, J. P. & Evans, H. J. Nuclear variables as a basis for determining or predicting radiosensitivity. (p. 505).*

Among variables which are of known or potential value for predicting the radiosensitivity of plants are nuclear volume, chromosome number, number and position of centromeres, amount and distribution of heterochromatin, size and number of nucleoli, and duration of the nuclear cycle.

4201 *Whiting, P. W. & Bush, D. J. A genetical* sensu stricto *approach to the gene. (p. 516).*

"A gene, defined as the unit of mendelian segregation, is all that coheres in the meiosis of the heterozygote so that only two types of haploid cells are formed. Its physical basis is a segment of chromonema that has become so differentiated that no recombination occurs within it during meiotic contact. A gene is known only by difference from its alleles in one or more of its 'factors'. A factor is indicated by a condition within a gene which, interacting with other genetical and environmental conditions, produces a specific effect. Within a gene there are doubtless very many factors which are unknown because similar in all its alleles. Changes in the states of these factors may occur (mutation) following irradiation. When these changes act as recessives they may be detected and their relationships analysed by complementation. Thus in the *R* alleles of *Mormonilla*, among about 200 tests made between deleterious mutant states, 97% show non-homology. This indicates a very large number of mutant factors, the majority of them being known by a single mutant stage recessive to its normal alternative in the wild-type allele. A few exist as multiple alternative states giving mutant-type compounds. A factor state causing female sterility is patent in some mutant genes and is marked by different (non-homologous) lethal factors in other mutant genes."

4202 *Wolff, S. The doubleness of the chromosome before DNA synthesis as revealed by combined X-ray and tritiated thymidine treatments. (pp. 517–18).*

When tritiated thymidine was applied to lateral roots of *Vicia faba* for 30 min. before an X-ray dose of 150 r., the first labelled cells to reach metaphase were found to have chromatid aberrations. "This indicates that as soon as the cell goes through the S period and DNA duplicates, the chromosomes react to radiation as though they were double. If the radiation is administered before the tritiated thymidine so that the labeled cells reaching metaphase will have had the chromosome breaks induced previous to S, the aberrations observed in the first group of labeled cells are still chromatid aberrations, indicating that the chromosome reacts to radiation as though double even before DNA duplication."

4203 Sisakjan, N. M. & Odincova, M. S.
(The nucleic acids of plant cellular structures).
Izv. Akad. Nauk SSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. 6 : 817–50. [Russian].

Topics discussed in this comprehensive review include the following: methods of isolating, extracting and estimating nucleic acids; the nucleic-acid content of nuclei, plastids, mitochondria, microsomes and other cell components; specificity of the nucleotide structure in nucleic acids derived from different plants; and the relationship between free and combined RNA in cellular structures.

4204 Savage, J. R. K. & Pearce, D. I.
Sodium chloride solution as an aid to smearing living pollen.
Stain Tech. 1960 : **35** : 286–87.

Treatment of *Tradescantia paludosa* anthers with a 1% NaCl solution, prior to making a smear, largely overcame the problem of pollen-grain clumping.

4205 Boyle, W. S.
A mechanical device for spreading chromosomes.
Stain Tech. 1961 : **36** : 91–92.

Satisfactory chromosome spreading was obtained by applying a series of rapid, sharp vibrations to the top of the cover slip with a "vibra-tool".

4206 Schaechter, M. & Laing, V. O.
Direct observation of fusion of bacterial nuclei.
J. Bact. 1961 : **81** : 667–68.

Intracellular nuclear fusion was observed, by phase-contrast microscopy, in living cells of *Escherichia coli* '15T⁻', a multinucleate strain, cultured on a medium containing chloramphenicol.

4207 Makarov, P. V.
(Electron microscopy of the cell nucleus and of the chromosomes).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1960 : **50** : 44–61. [Russian].

In a review of the literature both defects and advantages of the electron microscope are mentioned and some of the contradictions in the evidence obtained from it are referred to. An outline is given of the knowledge provided by electron microscopy on the structure of the nuclear membrane, the nucleolus and the chromosomes. It is finally pointed out that the hope that the electron microscope would make possible the identification of the gene as an element of the chromosome has not been realized.

4208 Savage, J. R. K. & Scott, D.
Chlorazol black E for plant cell nucleoli.
Stain Tech. 1961 : **36** : 85–86.

Chlorazol black E was shown to be a satisfactory stain for the study of nucleoli in root-tip cells of *Vicia faba* after fixation in formalin-aceto-alcohol. For autoradiographic studies, chromatin should be lightly Feulgen-stained before applying chlorazol black E.

4209 Jehle, H.
Charge fluctuation forces, biological specificity, and replication.
Science 1961 : **133** : p. 1367. (Abst.).

Attention is drawn to the possibility of interpreting (1) synapsis of homologous chromosomes during meiosis and (2) replica formation in the biosynthesis of proteins and nucleic acids on the basis of highly specific intermolecular associations brought about by charge fluctuation forces.

4210 Stanley, W. M. (Jun.) & Bock, R. M.
Mechanisms of expression of genetic information.
Nature, Lond. 1961 : **190** : 299–300.

The following hypothesis of information transfer from DNA to protein is developed. Each strand of the DNA helix directs the synthesis of a complementary RNA strand. One of these, on separation from the DNA, aggregates with a specific protein to form a complex which "crystallizes" into microsomes or ribosomes. This complex formation requires recognition of certain base sequences but not necessarily of the entire base sequence. The second RNA strand is envisaged to aggregate with a second protein to form an unstable complex which is cleaved and remoulded by cytoplasmic enzymes to form an aminoacid-activating-enzyme-soluble-RNA complex.

4211 Brenner, S., Jacob, F. & Meselson, M.
An unstable intermediate carrying information from genes to ribosomes for protein synthesis.
Nature, Lond. 1961 : **190** : 576–81.

Escherichia coli, grown in a heavy-isotope medium, was infected with T2 phage and immediately transferred to a light-isotype medium. The distribution of new RNA and new protein was then determined by density-gradient centrifugation. It was found that no new ribosomes were formed but new unstable RNA corresponding in base composition to the phage DNA was attached to the preexisting ribosomes. Information transfer therefore depends on the unstable "messenger" RNA and not on ribosomal RNA.

4212 Gros, F. *et al.*
Unstable ribonucleic acid revealed by pulse labelling of *Escherichia coli.*
Nature, Lond. 1961 : **190** : 581–85.

By exposing *Escherichia coli* to short pulses (10–20 sec.) of radioactive RNA precursors and examining the synthesized RNA by sucrose-gradient centrifugation, it has been possible to identify an unstable RNA fraction, distinct from ribosomal or transfer RNA. This unstable fraction is similar in sedimentation constant and attachment properties to T2-specific RNA and is thought to be messenger RNA [cf. 4211].

4213 Shah, V. C.
Histochemical studies of the activities of alkaline and acid phosphatases of normal and irradiated roottips of *Tulbaghia violacea* Harv.
Nucleus, Calcutta 1960 : **3** : 161–64.

In normal cells, alkaline-phosphatase activity was found mostly in the nuclei, with the highest concentration in the nucleoli. This enzyme was uniform in distribution and concentration among cells in the first 2–3 mm. of the root tips. Intense acid-phosphatase activity was detected in the apical region and in young lateral roots, being found mainly in the chromatin and polar regions of the dividing cells. The nucleoli were almost negative for acid-phosphatase. These observations suggest that alkaline and acid phosphatase respectively play an important part in the RNA and DNA synthesis. X-irradiation had no effect on the activity of the enzymes.

4214 Garber, E. D., Wyttenbach, E. G. & Dhillon, T. S.
Genetics of phytopathogenic fungi. V. Heterocaryons involving formae of *Fusarium oxysporum.*
Amer. J. Bot. 1961 : **48** : 325–29.

Heterocaryons were obtained between mutants of ff. *pisi*, *niveum*, *lycopersici* and *conglutinans*, differing in nutritional requirements, resistance to acriflavine and colony morphology and colour. On a minimal medium spores from the heterocaryons gave rise to "prototrophic" colonies resembling one component strain in morphology and colour. On a complete medium containing acriflavine, spores from heterocaryons between f. *pisi* and f. *lycopersici* produced colonies resembling those of f. *lycopersici* but showing acriflavine resistance, a property characteristic of f. *pisi*. Possible explanations of the apparent prototrophy on a minimal medium are considered. The occurrence of "prototrophic" colonies severely restricts the possibilities offered by the parasexual cycle in studying the origin and nature of the different forms. Experiments now in progress have been designed to determine the pathogenicity and host specificity of the "prototrophic" colonies.

4215 Wimber, D. E.
Asynchronous replication of deoxyribonucleic acid in root tip chromosomes of *Tradescantia paludosa.*
Exp. Cell Res. 1961 : **23** : 402–07.

"The asynchronous replication of DNA in parts of chromosomes in the root tips of *Tradescantia paludosa* was found to occur. Generally, the terminal portions of the chromosome arms were found to continue DNA duplication near the end of the DNA synthetic period while other parts of the chromosomes had ceased to synthesize. The localization of the DNA synthesis to specific sites on the chromosomes was found to correspond to an overall decrease in synthesis per nucleus during that portion of the synthetic period."

[Author's summary].

4216 SUBRAMANIAM, M. K. & SUBRAMANYAM, S.
Superposable pictures of chromosome structure of *Allium cepa* in Feulgen and haematoxylin squashes.
Curr. Sci. 1961 : **30** : 172–74.

A procedure in which hot (60° C.) N HCl is used as the medium for fixation as well as hydrolysis is described. The quadripartite structure of the metaphase chromosomes was demonstrated and it is stated that "the clarity of pictures in which the free ends of the chromonemata lie separated suggests that the pairs of chromonemata are enclosed within a pellicle."

Second conference on the mechanisms of cell division.
Ann. NY Acad. Sci. 1960 : **90** : 345–613.

4217 *Bloom, W. Changes in fine structure of parts of chromosomes after localized ultraviolet irradiation. (pp. 353–56).*

Differences in chromosome structure were visible under the electron microscope in formalin-fixed preparations of cultured somatic cells of urodele heart after localized ultraviolet irradiation. No differences were noted in cells fixed in osmic acid.

4218 *Taylor, J. H. Nucleic acid synthesis in relation to the cell division cycle. (pp. 409–21).*

Studies on cultured cells of Chinese hamster showed that chromosomes of a single complement duplicate asynchronously; differences in timing also occur between different sectors of the same chromosome. RNA synthesis was confined to the nucleus in these cells and the incorporation of nucleosides was continuous except during chromosome condensation during division. Protein synthesis was not affected by the stage of division.

4219 *Zirkle, R. E., Uretz, R. B. & Haynes, R. H. Disappearance of spindles and phragmoplasts after microbeam irradiation of the cytoplasm. (pp. 435–39).*

Heterochromatic ultraviolet microbeam irradiation of a small volume of the cytoplasm at metaphase in endosperm cells of *Haemanthus katharinae* (Amaryllidaceae) resulted in the disappearance of the spindle and a disturbance of the chromosome configuration. In some cells the chromosomes aggregated into several distinct groups, each of which became surrounded by a nuclear membrane. The distribution of the chromosomes appeared to be quite haphazard.

4220 *Stern, H. Aspects of deoxyriboside metabolism in relation to the mitotic cycle. (pp. 440–54).*

Experiments with the anthers of *Lilium longiflorum* show that, initially, most of the deoxyriboside content is located outside of the microspores in adjacent regions of the anther; this suggests that the control of chromosome duplication extends beyond the cells directly involved. It is concluded that DNA replication probably results from "the sequential induction of enzymatic activities by more than one regulatory agent".

4221 *Mazia, D. The analysis of cell reproduction. (pp. 455–69).*

Recent advances in the study of cell reproduction are considered under the headings Reproductive events of cell division, Mobilization of the mitotic apparatus, Energetics of cell division, Mitotic movements, Cytokinesis and Controls and regulations.

4222 *Gross, P. R. & Spindel, W. Heavy water inhibition of cell division: an approach to mechanism. (pp. 500–22).*

From experiments with the eggs of the sea urchin *Arbacia punctulata* and the annelid *Chaetopterus pergamentaceus*, it is suggested that while D_2O blocks mitosis at all stages, it does not destroy the achromatic apparatus but exerts a powerful stabilizing effect on them; this appears to be related to a sharp and reversible increase in cytoplasmic viscosity. The theory ascribes great importance to hydrogen bonds in the maintenance of the orderly structure of the achromatic figure and of the ground cytoplasm as a whole. "The substitution of D for H in some polymer-solvent systems will increase the strength of intermolecular cross links when these are hydrogen bonds, producing larger aggregates and higher viscosity or increased gel rigidity."

4223 *Hirshfield, H. I., Tulchin, N. & Fong, B. A. Regeneration and cell division in two protozoan species. (pp. 523–28).*

Daily cytoplasmic amputation of *Blepharisma undulans* and *Amoeba proteus* delayed but did not suppress cell division in these organisms. Further, sham-operated amoebae showed a lag in division rate equal to that in cells which had actually lost cytoplasm. It is concluded that cell division is probably controlled by factors more complex than nuclear-cytoplasmic ratios.

4224 *Rustad, R. C. & Rustad, L. C. Nuclear-cytoplasmic relations in the mitosis of sea urchin eggs. (pp. 531–35).*

Cytoplasmic amputation either before fertilization or at various times during the first mitotic cycle of *Arbacia punctulata* did not delay cell division; it is concluded that the time of cell division is independent of changes in cytoplasmic volume.

4225 *Harding, C. V., Srinivasan, B. D. Stimulation of DNA synthesis and mitosis by injury. (pp. 610–13).*

Evidence from experiments with whole mounts of rabbit lens epithelium suggests that, after damage, a mechanism which stimulates DNA synthesis and mitosis comes into operation; its influence spreads gradually outwards from the point of injury, giving rise to bands of dividing cells. It is not known whether a soluble substance is involved.

4226 DAS, N. K. & ALFERT, M.
Accelerated DNA synthesis in onion root meristem during X-irradiation.
Proc. nat. Acad. Sci. USA 1961 : **47** : 1–6.

The results of this investigation have been summarized from an earlier, brief report [90].

4227 STERN, H.
Periodic induction of deoxyribonuclease activity in relation to the mitotic cycle.
J. biophys biochem. Cyt. 1961 : **9** : 271–77.

Analysis of developing *Lilium* anthers showed DNase to be sharply periodic in its activity, which lasted only 4–8 hr. and was initiated prior to deoxyriboside formation. The significance of periodic enzyme induction is discussed in relation to cell morphogenesis.

4228 HOTTA, Y. & STERN, H.
Deamination of deoxycytidine and 5-methyldeoxycytidine in developing anthers of *Lilium longiflorum* (var. Croft).
J. biophys. biochem. Cyt. 1961 : **9** : 279–84.

The broad cycles of change found in deaminative activity are not considered to have any significance in relation to chromosome duplication.

4229 JENSEN, W. A., KAVALJIAN, L. G. & MARTINOT, S.
The incorporation of ^{3}H-thymidine by developing root tip cells.
Exp. Cell Res. 1960 : **20** : 361–67.

As a result of studies on the nuclei of onion root-tip cells, the relationship between the stage of cell development and DNA synthesis (Ds) was clarified. It appears that the cells of the apical initials divide infrequently, there being little Ds at this stage. Beyond the apical initials the cells begin to increase in diameter and to divide frequently and Ds occurs in more and more cells as the number of mitoses increases. As the number of cells in division reaches a peak and the cells approach their final diameter, elongation begins but Ds continues unaffected. Eventually, cells cease dividing; when this occurs the amount of DNA per cell is doubled as the products of Ds are no longer divided into two portions.

4230 AMBROSE, E. J. & BAJER, A.
The analysis of mitoses in single living cells by interference microscopy.
Proc. roy. Soc. : Ser. B 1961 : **153** : 357–66.

"A new method of using the interference microscope is described which enables a continuous record to be obtained of changes in dry mass and concentration during the growth of a single tissue cell. The method has been applied to the analysis of changes of dry mass in the chromosomes, spindle and cell-plate area during mitosis in endosperm [of *Leucojum aestiveum*]. The results of these observations have been compared with earlier studies of birefringence during mitosis. It is shown that birefringence develops under conditions of progressively increasing concentration of macromolecular material." [Authors' summary].

4231 CLOWES, F. A. L.
Duration of the mitotic cycle in a meristem.
J. exp. Bot. 1961 : **12** : 283–93.

The duration of the total mitotic cycle was determined in six regions of the apical meristem of maize roots, by measuring the rate of (1) labelling nuclei with radioactive thymidine and (2) accumulation of metaphases in roots treated with colchicine. The mitotic cycle lasted from 12 hours in the cap initials to about 200 hours in the "quiescent centre" of the same roots.

4232 HIRAOKA, T.
Somatic syndesis in *Daphne odora*. I. The chromosome behaviour in mitosis.
Proc. Japan Acad. 1958 : **34** : 700–05.

Observations on dividing cells from various parts of the plant showed that active chromosome pairing occurs at anaphase or telophase and may persist to metaphase in a passive form.

4233 Hiraoka, T.

Somatic syndesis in *Daphne odora*. II. The chromosome behaviour in meiosis.

Proc. Japan Acad. 1958 : **34** : 706–11.

Somatic chromosome pairing at the last premeiotic anaphase is "cancelled" at leptotene and is superseded by meiotic pairing. Some cases of nondisjunction were observed and the results of chromosome counts suggest that, while no active pairing occurs during anaphase I, there is "a certain possibility" that pairing may occur during anaphase 2 between chromosomes originating from nondisjunction. [Cf. 4232].

4234 Li, N. & Jackson, R. C.

Cytology of supernumerary chromosomes in *Haplopappus spinulosus* ssp. *cotula*.

Amer. J. Bot. 1961 : **48** : 419–26.

The behaviour of supernumeraries in *H. spinulosus* spp. *cotula* ($2n = 8$) showed one interesting exception to that usually observed in other plants. An end-to-end association of the two supernumeraries with a regular bivalent was observed during prophase in some microsporocytes. This association apparently resulted in a permanent fusion of the chromosome ends since in some cases the union persisted throughout both meiotic divisions.

4235 Torrey, J. G.

Kinetin as trigger for mitosis in mature endomitotic plant cells.

Exp. Cell Res. 1961 : **23** : 281–99.

The ability of kinetin to stimulate mitosis, particularly among tetraploid cells, in mature pea root segments growing in a synthetic medium, was demonstrated. It was concluded that "kinetin specifically triggers mitosis in mature pea root tissue cells which have undergone DNA- and chromosome-doubling by endomitotic reduplication before kinetin treatment."

4236 LaChance, L. E. & Steffensen, D. M.

The influence of carbon dioxide on *Tradescantia* chromosome aberrations induced by radiations of different ion densities.

Exp. Cell Res. 1960 : **20** : 519–28.

The number of chromosome exchanges and interstitial deletions induced in *Tradescantia* chromosomes by X, γ and 14·1 Mev neutron irradiation was significantly higher in a mixed air - carbon dioxide (CO_2) environment than in a normal air environment. Various hypotheses accounting for the CO_2 effect are discussed. It is suggested that CO_2 increases the frequency of aberrations by decreasing protoplasmic viscosity; this promotes chromosome movement, and thus new reunions are favoured rather than restitutions [cf. XXV, 3056].

4237 Sax, K.

Radiation sensitivity of *Tradescantia* microspore chromosomes to a second exposure of X-rays.

Radiation Res. 1961 : **14** : 667–73.

The sensitivity of *Tradescantia* chromosomes, already exposed to 400 r. at the resting stage, to a further dose of 50, 70 or 100 r. at prophase was much higher than in chromosomes subjected only to prophase irradiation. The first exposure produced only chromosome aberrations, while the second produced only chromatid aberrations.

4238 LaChance, L. E.

Studies on the effect of carbon dioxide on X-ray induced chromosome aberrations in *Tradescantia*, I. Duration of the pretreatment effect.

Proc. nat. Acad. Sci. USA 1960 : **46** : 1501–06.

Pretreatment of inflorescences with 1 atmosphere of CO_2 + 1 atmosphere of air increased the frequency of aberrations (exchanges and interstitial deletions) induced by exposure to 280 r. of X rays in air alone by about 1·6 times. The results of separating the CO_2 pretreatment and irradiation by increasing periods in air indicated that the CO_2 effect persisted for about 20 minutes. Subsequent to CO_2 treatment, the rate of oxygen uptake of the tissues was greatly increased. Possibly changes in nucleoplasmic viscosity and oxidative metabolism may alter the frequency of aberrations incited by radiation.

4239 Merz, T. & Swanson, C. P.

Interaction of chromatid breaks produced by X-rays and radiomimetic compounds.

Science 1961 : **133** : 703–05.

Using roots of *Vicia faba*, an analysis was made of the effects of (1) combined treatments of 8-ethoxycaffeine (EOC), maleic hydrazide (MH), β-propiolactone (BPL) or potassium cyanide (KCN) and X rays, and (2) treatment with EOC + MH and with BPL + KCN. Interaction between broken ends of chromatids, as indicated by increased frequencies of exchanges, was detected in all treatments with a chemical + X rays but none was found for (2). The results are discussed in terms of (*a*) possible disparities in the bonds broken and (*b*) the effects of temporal and spatial differences in the breaks induced by different agents.

4240 Beatty, A. V. & Beatty, J. W.
Potassium gluconate and ATP effects on chromosome aberration yield.
Proc. nat. Acad. Sci. USA 1960 : **46** : 1488–92.

Frequencies of aberrations (exchanges) induced in microspores of *Tradescantia paludosa* exposed to 400 r. of X rays and chemical treatments before or after irradiation were determined. With irradiation at 30° C. and pretreatment in ATP, potassium gluconate and 6-phosphogluconate, the frequencies were respectively 0·14, 0·13 and 0·12 per cell, the frequency in the control being 0·24. Microspores simultaneously pretreated with ATP and gluconate gave a frequency of 0·10. With irradiation at 40° C., the frequencies for the control, ATP, gluconate and 6-phosphogluconate pretreatment and simultaneous pretreatment with ATP and gluconate were respectively 0·66, 0·19, 0·21, 0·23 and 0·17. Corresponding figures for microspores irradiated at 0·2° C. were 0·14, 0·10, 0·11, 0·09 and 0·10. The results from posttreatment with gluconate or ATP indicated that the protective action of these compounds was due to their effect on the recovery process rather than on chromosome breakage. Both the glycolytic and hexose monophosphate pathways appear to be capable of releasing energy for repair from radiation damage.

4241 Evans, H. J. & Bigger, T. R. L.
Chromatid aberrations induced by gamma irradiation. II. Non randomness in the distribution of chromatid aberrations in relation to chromosome length in *Vicia faba* root-tip cells.
Genetics 1961 : **46** : 277–89.

"1. A study of the frequencies with which the various chromosomes of *Vicia faba* root-tip cells were involved in interchange or isochromatid breakage following irradiation revealed that the frequency with which a given chromosome is involved in such aberrations is not proportional to its length at metaphase.

"2. Whereas the distribution of points of exchange along the metacentric M chromosomes was approximately rectangular, the distribution for the acrocentric S chromosomes was non random, there being a significant excess of aberrations at the midchromosome regions and a deficiency at the centromere and distal ends.

"3. It appeared that there was an association between the distribution of aberrations and the distribution of heterochromatin, there being a tendency for more aberrations to occur in or near heterochromatic regions. This association is believed to be due to an increased probability of heterochromatic or associated euchromatic chromosome regions to be in close proximity due to chromocentre formation in the interphase nucleus and is thought to be mainly responsible for the non random distribution of aberrations along the chromosomes and for the differences in aberration distribution within the M and S chromosomes.

"4. The relatively low frequency of interchange involving the nucleolar or M_2 chromosome arm was not paralleled by a similar reduction in isochromatid aberration frequencies suggesting that this low frequency was due to the nucleolus acting as a physical barrier between the nucleolar and other chromosomes.

"5. Data are presented on the frequencies of interchange between homologous chromosomes in diploid cells and in tetraploid cells which were irradiated in the interphase following their induction by colchicine treatment. The threefold increase in interchange between homologous chromosomes in tetraploid cells is in accord with the suggestion that little chromosome movement occurs during interphase."

[Authors' summary].

4242 Rees, H.
Genotypic control of chromosome form and behaviour.
Bot. Rev. 1961 : **27** : 288–318.

Drawing mainly upon relevant literature dealing with plants, the author analyses various aspects of the genotypic control of chromosome structure and behaviour. First considering in general terms the causes and kinds of chromosome variation, he then discusses (1) the role of major-gene variation in controlling chromosome behaviour, (2) the part played by polygenic variation in chromosome variation, with reference to inbreeding and hybridity, (3) the possible adaptive significance of chromosome variation, (4) the response of such variation to artificial selection and (5) the genotypic control of chromosome behaviour in relation to the entire genetic system.

4243 Sharma A., & Sharma, A. K.
Amino acid interference in chromosome metabolism.
Nucleus, Calcutta 1960 : **3** : 215–24.

The main effects of treating root tips of bulbs of *Allium cepa* and *Hemerocallis* with citrulline, tryptophane, tyrosine, ornithine, arginine and histidine were chromosome fragmentation, somatic reduction and polyploidy. Frequency of somatic reduction was particularly high after treatment with ornithine and citrulline. Only tryptophane failed to induce polyploidy. It is postulated that the increase induced in protein synthesis altered the viscosity of the cytoplasm so as to cause spindle inhibition and thus polyploidy. The somatic reduction is attributed to disturbance, due to the increase in protein synthesis, in a specific balance between nucleic acid and protein synthesis in the cytoplasm, considered to be necessary for equational division. The fragmentation is ultimately ascribed to a deficiency of nucleic-acid precursors required for chromosome replication, this deficiency resulting from utilization of the precursors in the synthesis of cytoplasmic nucleoprotein under the conditions of increased protein synthesis.

4244 Rieger, R. & Michaelis, A.
Die Bedeutung von ATP für die radiomimetische Wirkung von Äthylalkohol bei *Vicia faba.* (**The importance of ATP for the radiomimetic action of ethyl alcohol in *V. faba***).
Naturwissenschaften 1961 : **48** : p. 139.

The addition of adenosine triphosphate (ATP) fully compensated for the inhibiting effect of 2,4-dinitrophenol on the radiomimetic action of ethyl alcohol, indicating that a normal supply of ATP is necessary for the radiomimetic action. In the case of potassium cyanide which also inhibits the action of ethyl alcohol, there was partial compensation by the addition of ATP.

4245 Rieger, R. & Michaelis, A.
Der Einfluss von Stoffwechselinhibitoren auf die radiomimetische Wirkung von Äthylalkohol. (**The influence of metabolic inhibitors on the radiomimetic action of ethyl alcohol**).
Mber. dtsch. Akad. Wiss. Berlin 1960 : **2** : 290–97.

In root cells of *Vicia faba*, the radiomimetic effect of alcohol was considerably reduced by anaerobiosis and by treatment with the respiratory inhibitors 2,4-dinitrophenol, potassium cyanide and hydroxylamine, these substances being applied simultaneously with the alcohol. The radiomimetic effect was not altered when methylene blue was applied together with the potassium cyanide, indicating that the influence of the cyanide was due to inhibition of the activity of cytochrome oxidase. It is supposed that a certain quantity of adenosine triphosphate (ATP) in the cell is a prerequisite for the radiomimetic action of ethyl alcohol. The application of 2,4-dinitrophenol 2 hr. after the treatment with ethyl alcohol increased the proportion of metaphases with aberrations. The radiomimetic effect was also reduced when sulphathiazol was applied together with the ethyl alcohol and when chloramphenicol was applied before the alcohol.

4246 Davidson, D. & Anderson, N. G.
Chromosome coiling: abnormalities induced by polyamines.
Exp. Cell Res. 1960 : **20** : 610–13.

Abnormalities induced in lateral roots of *Vicia faba* by 0·5 mM solutions of putrescine, cadaverine and spermine, included the inhibition of chromosome uncoiling at late anaphase and early telophase, and the fusion of metaphase chromosomes into a single, amorphous mass. It is pointed out that polyamines form stable complexes with DNA-protein; this may account for their ability to disrupt normal chromosome coiling and uncoiling.

4247 Giménez-Martín, G. & López-Sáez, J. F.
Mutagénesis por acción del γ-hexaclorociclohexano. (**Mutagenesis by the action of γ-hexachlorocyclohexane**).
Phyton, Vicente López 1961 : **16** : 45–55.

Aneuploidy and polyploidy, as well as structural aberrations, were induced in *Allium cepa* root-tip cells by the action of γ-hexachlorocyclohexane. The cytological mechanisms accounting for the development of these aberrations are described [cf. 105].

4248 Kihlman, B. A.
The radiomimetic effect of N-nitroso-N-methylurethan in *Vicia faba*.
Exp. Cell Res. 1960 : **20** : 657–59.

Chromosome aberrations induced in root-tip cells by N-nitroso-N-methylurethane (NMU) consisted of isolocus breaks and chromatid exchanges. The number of aberrations increased at higher temperatures but was unaffected by changes in the oxygen concentration. A higher proportion of the breaks occurred in the long chromosomes of *V. faba* than after similar treatment with nitrogen mustard or diepoxypropyl ether. It is suggested that the radiomimetic effects of NMU are due to its alkylating properties.

4249 Evans, H. J.
Chromatid aberrations induced by gamma irradiation. I. The structure and frequency of chromatid interchanges in diploid and tetraploid cells of *Vicia faba*.
Genetics 1961 : **46** : 257–75.

Chromatid aberrations induced in root-tip cells of *V. faba* may be classified into eight categories on the basis of three criteria: (1) the polarity of the chromosomes involved; (2) the type of exchange, i.e. whether the exchange is of the U or X type; and (3) the completeness or incompleteness of the exchange. The three criteria appear to be, in general, independent of one another. Data from four studies on interchanges in diploid roots indicated that at least 80–90% of the chromosomes were polarized during interphase and the exchange was of the U type in about 70% of the interchanges observed at metaphase. There was thus a significant excess of asymmetrical interchanges. It is suggested that the presence of U and X types of interchanges does not result from differences in the arrangements of the chromatids at the time of initiation of the exchange, but is rather an expression of two mechanically different types of exchange in interphase.

A study was also made of the frequencies of chromatid interchanges and isochromatid aberrations in diploid and induced tetraploid cells of roots subjected to colchicine for 3½ hr. prior to irradiation. The relative frequencies of the eight types of interchange were found to be similar in 4*n* and 2*n* cells. As 4*n* cells would have passed through two interphases without an intervening polarizing anaphase, the fact that chromosome polarity in 4*n* cells is as frequent as in 2*n* cells, together with the observation that there is a large increase in the frequency of interchange between homologous chromosomes in 4*n* cells, implies that little chromosome movement occurs during interphase and throughout c-mitosis. Observations on the relative frequencies with which the arms of metacentric and acrocentric chromosomes underwent interchange indicated that in both 2*n* and 4*n* cells the frequency of interchange per chromosome was not directly proportional to the metaphase length of the chromosomes. Chromatid interchanges and isochromatid breaks were found to be twice as frequent in 4*n* as in 2*n* cells, i.e. the frequency per chromosome was the same for both cell types. The distribution of isochromatid breaks between cells, in 2*n* and 4*n* cells, fitted a Poisson distribution, while the distribution of interchanges was non-random.

4250 Škvarnikov, P. K.
(Increase in chromosome number as a result of translocation in *Crepis capillaris*).
Citologija (Cytology) 1959 : **1** : 48–54. [Russian].

The chromosome complement of ethyleneimine-treated *C. capillaris* cells increased from 6 to 7, as a result of the substitution of one C and one D chromosome by three other chromosomes designated c, d and G. Details are provided of the origin and morphology of these chromosomes and of their behaviour during mitosis. This study, and related investigations, are discussed with reference to the evolution of chromosome number.

4251 Jacob, F. & Wollman, E.
Sexduction et analyse fonctionelle chez les bactéries. (**Sexduction and functional analysis in bacteria**).
CR Soc. Biol., Paris 1960 : **154** : 1960–63.

A number of studies on genetic mechanisms related to sexuality in bacteria are discussed.

4252 Berg, R. L.
The ecological significance of correlation pleiades.
Evolution, NY 1960 : **14** : 171–80.

Evidence of correlation pleiades, i.e. manifestations of the independence of certain developmental processes with respect to other processes within the organism, were sought in 19 herbaceous species through the measurement of various quantitative characters of the vegetative and reproductive plant parts. The presence of correlation pleiades was demonstrated in 12 of the 19 species and, in all of the 12, it was the flower dimensions which had become independent of correlations within the organism. The presence of pleiades was associated with the need for a specific insect pollinator. It was found earlier [cf. XXIX, 937] that the dimensions of flowers requiring specific insect pollinators are more stable than those of organs such as stems and leaves. It is concluded that the general principle underlying the origin of developmental homeostasis is also responsible for the origin of correlation pleiades.

4253 Edwardson, J. R. & Corbett, M. K.
Asexual transmission of cytoplasmic male sterility.
Proc. nat. Acad. Sci. USA 1961 : **47** : 390–96.

Cytoplasmic male sterility was transferred from male-sterile to male-fertile petunia plants by grafting; the cytoplasmic factors were subsequently transmitted through the seed. It is concluded that there was a transfer of factors across the graft union and an analogy is drawn between this phenomenon and virus infection.

4254 Schlösser, K.
Cytologische und cytochemische Untersuchungen über das Pollenschlauchwachstum selbststeriler Petunien. (**Cytological and cytochemical investigations on the pollen-tube growth of self-sterile petunias**).
Z. Bot. 1961 : **49** : 266–88.

Pollen-tube growth in self (S) and cross (C) pollinations was studied. S pollen tubes had thicker walls, due to greater production of substances related to pectin and cutin, and produced more callose. Mitosis occurred later and was less regular in S than in C pollen tubes and in both cases took place only when the nucleus was not more than 50 μ from the tip of the tube. Uptake of P^{32} was greater in S pollen tubes. Reduction of starch content was greater in S styles, with amylase activity in inverse relation to starch content. Acid phosphatase activity during the self-sterility reaction and cytochrome oxidase activity during the whole of pollen-tube growth were higher in S pollen.

4255 Loeb, T. & Zinder, N. D.
A bacteriophage containing RNA.
Proc. nat. Acad. Sci. USA 1961 : **47** : 282–89.

Evidence that bacteriophage *f*2 contains RNA and not DNA as its nucleic acid is presented.

4256 Wecker, E. & Schonne, E.
Inhibition of viral RNA synthesis by parafluorophenylalanine.
Proc. nat. Acad. Sci. USA 1961 : **47** : 278–82.

It is suggested that viral RNA synthesis and protein synthesis are intimately linked and that the above aminoacid analogue inhibits RNA synthesis by competitive inhibition of aminoacid incorporation.

4257 Takami, W.
(**Physiological studies on pollen, in particular, the effect of trace elements on germination**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1961 : **74** : 142–53. [Japanese].

Studies with various species have shown that appropriate amounts of the trace elements B, Cu, Fe, Mn, Mo and Zn, and in two cases, of asparagine, markedly promote pollen germination.

TAXONOMY

4258 Purdy, S. J. & Truter, E. V.
Taxonomic significance of surface lipids of plants.
Nature, Lond. 1961 : **190** : 554–55.

Characteristic chromatographic patterns were obtained for the leaf-surface lipids of 10 species of monocotyledons and 14 representatives of dicotyledons at the Textile Chemistry Laboratory, Leeds University, England. The monocotyledonous species were: *Festuca pratensis*, *F. ovina*, *F. rubra* var. *genuina*, *Dactylis glomerata*, *Phleum pratense*, *Agrostis tenuis*, *Alopecurus pratensis*, *Lolium italicum*, *L. perenne* and *Holcus mollis*. The following were among the dicotyledonous taxa: *Fraxinus excelsior*, *Aesculus hippocastanum*, *Malus* spp., a *Rosa* hybrid, *Brassica oleracea* ssp. *gemmifera*, *B. oleracea* var. *capitata*, *Beta vulgaris* and *Trifolium repens*.

4259 Belozerskij, A. N. & Spirin, A. S.
(**Composition of nucleic acids and systematics**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. **1** : 64–81. [Russian].

Biochemical differences in nucleic acids in organic life, including higher plants, are discussed in relation to systematics. It is thought that further studies along these lines may facilitate the construction of evolutionary systematics and elucidate phylogenetic interrelations between different species.

CROP PLANTS

4260 Kökeny, B.
Metodi del miglioramento genetico delle piante. (**Methods of genetic improvement of plants**).
Progr. agric., Bologna 1961 : **7** : 368–71.

The methods described include mass, family and individual selection, various systems of crossing, the production of single and double crosses and synthetics and the induction of mutations, this last category including the induction of polyploids.

Twenty-ninth Annual Report of the Minister for Agriculture, Dublin 1959–60 : Pp. vi + 138 + [123].

4261 *Special technical and advisory work.* (*pp. 55–71*).

Wheat. At the Cereal Station, Ballinacurra, Co. Cork, work continued on progenies of (1) crosses between commercial varieties such as Atle, Atson, Svenno, Kärn II [Kernel II] and locally-developed selections, and (2) more recent crosses between spring varieties and varieties having good milling and bread-making qualities and resistance to *Cercosporella* eyespot, mildew and stem and leaf rusts [cf. 1360]. Atle, Safir and Koga II were crossed with an early-maturing, stem-rust resistant selection from Redman x Hybrid 27.

Barley. Crosses of (1) Proctor, Hunter, Banba, Carlsberg and several other commercial barleys with selections developed at Ballinacurra, (2) the mildew-resistant variety Isaria with Banba and Spratt-Archer x Kenia 33 and (3) the X-ray induced mutant XC–11 with varieties such as Hunter, Ymer and Maythorpe were further selected. One selection of Hunter x XC–11 was notable for its malting properties. Selections of neutron-treated Beorna were also studied. To extend breeding for mildew resistance, Union, Volla and Vienna were used as sources of resistance in crosses with Hunter, Proctor and Banba.

Potato. Further crosses were effected in breeding for disease resistance and other characters.

4262 *Report of the Agricultural Department, University College, Dublin, for the year 1959–60.* (*Pp.* [*1*]–[*22*]).

Wheat. In winter-wheat improvement, selections were made from Cappelle x Heines 13161, Cappelle x Desprez and several crosses involving Glasnevin Rosa. In work on spring wheat, F_1 and F_2 hybrids between spring varieties and between winter and spring varieties were grown for future selection.

Oats. Selections of Glasnevin Triumph x Major, Triumph x Blenda and Minor x Pendek were among the material studied.

Barley. With the aim of developing a high-yielding, stiff-strawed fodder type, further selections were obtained from Rika x Kenia, Carlsberg x Piroline, Proctor x Piroline, Spratt Archer 37/3 x Drost [Seneschal] and several other crosses.

Grasses. Strain building in perennial ryegrass, cocksfoot and timothy continued.

Brussels sprouts. Varieties developed in the Irish Republic gave a good performance in trials in Scotland, England and New Zealand [cf. 3938].

The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland 1959 : 9 : 107–282.

4263 *Agricultural entomology division.* (*pp. 155–68*).

Oats. Trials at Ballintoy, Co. Antrim, showed that Milford and Early Miller, both of which show some resistance to *Ditylenchus dipsaci*, are suitable substitutes for Sandy and other susceptible varieties.

Potato. The continuous cultivation of eelworm-resistant varieties in infested soil led to a marked reduction in the number of viable *Heterodera rostochiensis* cysts in the soil. A number of resistant hybrid lines [cf. 159] have shown sufficiently promising tuber characteristics to warrant consideration for registration as commercial varieties.

4264 *Plant breeding division.* (*pp. 197–205*).

Oats. Back crossing of mildew-resistant material continued.

Ryegrass. Trials of the potential value of two new polycross strains are reported. Plants showing field resistance to *Puccinia coronata* have been selected and are to be used in a study of the inheritance of the disease. The programme for the development of lines resistant to *Gloeotinia temulenta* continued [cf. 160].

Potato. Further crosses were made with a view to developing lines combining blight resistance with favourable commercial characteristics. Attempts are being made to utilize the eelworm resistance present in tetraploid material derived from *Solanum vernei* and *S. sanctae-rosae*. Back-cross material, with eelworm resistance derived from *S. tuberosum* ssp. *andigenum*, showed high susceptibility to blight in field tests. High resistance to *Streptomyces scabies*, combined with desirable commercial characteristics, has been shown by 200 seedlings, out of 1000 tested. Many of the seedlings obtained from material hypersensitive to virus X [cf. 160], had unsatisfactory tuber shapes. Seedlings resulting from natural selfing of commercial varieties and selected breeding material were, in general, less vigorous than seedlings obtained by cross pollination.

4265 *Plant pathology division.* (*pp. 207–26*).

Potato. Tabulated data are provided on the incidence of viruses X and S on 23 varieties. Ten varieties are classified on the basis of their reaction to virus Y [cf. 161]. The existence of four distinct strains of virus A was demonstrated.

Apple. Detailed studies on factors influencing resistance to *Penicillium expansum* are reported. Apples grown under Northern Ireland conditions were found to be slightly more resistant than those grown in Britain.

4266 *The horticultural centre.* (*pp. 249–56*).

Tomato. *Lycopersicon esculentum* x *L. pimpinellifolium* crosses are being back crossed to

L. esculentum with a view to improving fruit size. PH, a promising, early-maturing hybrid, has been selected.

4267 *Potato variety and registration trials. (pp. 273–82).*

The outstanding varieties in yield trials conducted during 1954–59 were as follows: first earlies, Arran Pilot; second earlies, Craig's Royal; early maincrop, Dr. McIntosh; and maincrop, Ulster Supreme.

4268 Wilson, E. V. B.
The University and Agriculture. 8. The Plant Breeding Division.
Agric. N. Ire. 1961 : **35** : 344–48.

An account is given of the activities of the Plant Breeding Division, Manor Estate, Loughgall, Co. Armagh, N. Ireland. Breeding, which was originally confined to oats and flax, now includes barley, perennial and Italian ryegrass and potatoes [cf. 160].

4269 **Annual Report of the Plant Breeding Institute, Cambridge, 1959–60** : Pp. viii + 72.

In a feature article on developments in wheat breeding methods, an outline of the aims of the Cambridge wheat-breeding programme is followed by a discussion of selection techniques; these include the choice of parents, selection within hybrid populations, trial layout and design, assessment of seasonal variation, selection for disease resistance and selection for grain quality. The article ends with a note on the use of artificially induced mutations and an account of long-term investigations, including physiological studies and the use of wide crosses.

Arabidopsis thaliana is being used as a test organism in induced mutation studies. Attention has been concentrated on obtaining high mutation rates; the highest rate so far (38% of X_1 plants setting seed) was achieved using ethyl methane sulphonate. The mutants were classified into 38 groups based on phenotypic characters. Generally, no obvious differences were found in the mutation spectra resulting from different treatments. However, a giant, late-flowering mutant occurred nine times and a round-leaf mutant occurred ten times after X-irradiation, while neither has appeared after chemical treatment. There was no indication of treatments causing mutations preferentially in different organs. Within a phenotypic class, all possible crosses were made and some morphologically identical mutants were found to be genetically distinct.

Wheat. TB106/40 which was bred from Holdfast x Cappelle-Desprez performed well during 1960. It is slightly taller than Cappelle-Desprez, which it resembles in disease resistance and field characters, and has the high milling and bread-making quality of Holdfast. TB31/23 from [(Squarehead's Master x Holdfast) x Nord-Desprez] has given yields equal to those of Cappelle-Desprez. A series of incomplete diallel sets of crosses was planned, each including five reference varieties representing the genotypes in general cultivation in Britain: Cappelle-Desprez, Heine VII, Holdfast, Hybrid 46 and Minister. Preliminary data from the first of these sets indicate that crosses of Hybrid 46 with the Canadian varieties Relief and Wasatch may prove particularly useful.

Studies on the inheritance of grain quality indicated that the milling type of an individual grain on a heterozygous F_1 plant is not entirely determined by the plant on which it is borne, but is at least partly determined by the genotype of the endosperm itself. In investigations of the inheritance of seven other components of grain quality, the genetic systems for each character showed varying degrees of dominance and an almost complete lack of genic interaction.

A programme was initiated to utilize the effects of natural selection in a partially outbreeding population; a number of ears were emasculated to encourage crossing. It was found that a high degree of male sterility could be induced by subjecting pot plants at the time of meiosis to a severe drought for 3–4 days followed by normal watering; the stigmas and ovaries were not affected.

Evidence is provided that homeologous pairing in *Triticum aestivum* is suppressed by a gene located on chromosome V [cf. XXX, 3794–5]. Since chromosome V belongs to genome B which derives from a diploid species of the *Sitopsis* section of *Aegilops*, species belonging to this section were crossed with *T. aestivum* to determine the effect of their genomes. It was found that the *Ae. speltoides* genome suppresses the influence of wheat chromosome V while the genomes of *Ae. longissima* and other species have no effect on homeologous pairing. It is therefore concluded that the activity of chromosome V does not derive from the donor of the B genome but from a mutation which has occurred since the origin of polyploidy in wheat. Since all tetraploid wheats form only bivalents, the mutation probably occurred early in tetraploid evolution. Attempts are being made to exploit the altered patterns of meiotic pairing which result when chromosome V is absent.

To provide direct evidence that genome D of hexaploid wheat was donated by *Ae. squarrosa*, a hybrid was made between this species and *T. aestivum*. In the hybrid, "meiosis was such that there could be no doubt that the chromosome set of *Ae. squarrosa* was present in *T. aestivum*."

New alien-chromosome addition lines were obtained which have the full chromosome complement of wheat plus single pairs of rye chromosomes [cf. XXX, 3781]. A number of monosomic and disomic addition lines in which the chromosomes of *Ae. longissima* were added to the wheat complement were also developed. New lines in which rye chromosome II was substituted for one of the wheat pairs were obtained; it was not possible to replace some of the wheat chromosome pairs. In some cases where vigorous substitution plants were obtained, these were infertile; other substitution plants were more fertile but have not yet been fully evaluated. In studies on the translocation of foreign material to wheat chromosomes, one line was obtained in which a segment of rye chromosome II carrying the gene for yellow rust immunity has been translocated to wheat chromosome III.

A series of 21 monosomic lines is being developed in Koga II by back crossing to the Chinese Spring series. Further monosomics were obtained from Holdfast; it was found that the dominant awn-suppressing gene in Holdfast is carried on chromosome IX. Holdfast and Chinese Spring were shown to differ by a reciprocal translocation involving chromosomes III and XVI.

Single-plant selections were again made from derivatives of hybrids between *T. aestivum* and hexaploid *Triticum-Triticum* amphidiploids. *T. persicum* and *T. dicoccum* are being used as sources of resistance to powdery mildew, and *T. spelta* var. *album* for resistance to yellow rust. Seven genes conferring yellow-rust resistance at the seedling stage were identified at four loci distributed in the following varieties: Chinese 166 (*Yr*1), Heine VII and Soissonais [Soissons] (*Yr*2), Minister (*Yr*3c), Cappelle-Desprez (*Yr*3a.*Yr*4a) and Hybrid 46 (*Yr*3b. *Yr*4b). Other varieties are being investigated.

Oats. Breeding for stiff straw and improved winter hardiness continues. The F_3 from crosses of two forms of *Avena ludoviciana* with Barnwell, CA148 No. 5 and Penrhyn included material combining the powdery mildew resistance of the wild forms with the field appearance and grain quality of the cultivars. High-yielding spring oats were obtained from crosses of Blenda with Glasnevin Success, Onward and Stormont Iris; Cc4146/4 is being used to introduce powdery-mildew resistance into the most promising selections. Material from a number of crosses was selected for resistance to *Ditylenchus dipsaci* and *Oscinella frit.* Data were obtained from an incomplete diallel series of crosses made with the aim of selecting parents for high-yielding varieties with resistance to powdery mildew and stem eelworm; seven crosses were retained for intensive selection.

Barley. Two promising hybrids are described. HB196/10/5 is a selection from Spratt Archer x Freja; it ripens at about the same time as Maythorpe but is superior to the latter in yield, straw strength and malting quality. HB281/6/5/9 [(B2145 x HB34) x HB34] has powdery-mildew resistance and high malt quality. A dwarf mutant of the *erectoides* type obtained from X-irradiated Proctor behaved as a simple recessive in crosses with Proctor and Rika. When it was crossed with Domen, however, it was impossible to distinguish pure-breeding and segregating lines.

Studies on the effect of various mutagenic treatments on Earl, Bonus and Proctor continued. No differences were observed between treatments in the spectra of chlorophyll mutations exhibited in the X_2. In the X_3 population from X-irradiated Earl, twenty-five selections were made for stiff straw, vigorous growth, leafiness and grain size.

The six-rowed variety USDA235, which is resistant to *Ustilago nuda* f. sp. *hordei*, was crossed with two two-rowed closed-flowering varieties with the aim of developing two-rowed varieties combining the "physiological" resistance of the former with the "functional" resistance of the latter.

Grasses. North African ecotypes of *Festuca arundinacea* have shown an outstanding capacity for winter growth; some promising selections are being grown and two synthetics are being multiplied. Mother plants of *Dactylis glomerata* were selected for inclusion in polycross plots. Forms giving high forage yields were selected from a collection of mostly Continental varieties of *Secale cereale*.

Lucerne. Hybrids involving *Medicago sativa* var. *gaetula* were highly resistant to *Verticillium albo-atrum*. Diploid plants of *M. hemicycla*, which is also *Verticillium* resistant, were colchicine treated and crossed as males to inbred lines of *M. sativa*; seed setting was poor and it is considered that the relationship between the two species is more distant than Sinskaja has suggested.

Further studies on the inheritance of flower colour confirmed that the "white flower" factor is recessive and shows tetrasomic inheritance; it is considered however that this factor does not account for all cases of white flowers. The inheritance of weak pigmentation (designated "trace") was not clear but appeared in one case to involve a locus distinct from the "white flower" locus.

Red clover. Attempts to introduce resistance to *Ditylenchus dipsaci* into selected inbred lines of broad red clover continued. Resistance was not inherited simply but appeared to involve the operation of complementary factors.

Potato. Breeding from *Solanum vernei* which is resistant to biotypes A and B of *Heterodera rostochiensis* continues. Tetraploid F_1 hybrids of *S. multidissectum* x *S. tuberosum* which are B-resistant and A-susceptible were crossed with A-resistant *S. andigena* clones. Colchicine-induced hexaploids were obtained from two clones of triploid *S. juzepczukii* which is B-resistant and A-susceptible; in contrast to the triploids which are completely sterile, the hexaploids proved fertile in several crosses.

A family from a cross between Southesk (which is top necrotic to viruses X, A and C) and Katahdin (susceptible to X, A and C) was scored for necrotic response to the three viruses. "It appeared that the three dominant genes for top necrosis to the three viruses are linked, and that in Southesk no two dominant genes occur together on the same chromosome (the potato being an autotetraploid)."

Sugar beet. Breeding for tolerance to viruses and selection for resistance to *Erysiphe polygoni* and bolting continued. Vigorous plants selected from bulked monogerm lines included homozygous monogerm individuals, most of which were self fertile, and multigerm heterozygotes. Crosses were made between monogerm individuals and a number of lines selected for tolerance to virus yellows. The hybrids were interpollinated or back crossed to the tolerant lines to increase the frequency of self-sterile plants.

Kale. Breeding work on short marrow-stem kales is now being directed to improving total yield by selection of inbreds with thicker stems and high dry-matter content. Selection is also being made for greater resistance to *Brevicoryne brassicae*, *Erysiphe polygoni* and *Peronospora parasitica*. The development of medium and tall kales suitable for mechanical harvesting continues.

Attempts to facilitate the recognition of plants homozygous for the self-incompatibility gene *S* are in progress. The *S* locus is closely linked with that of a gene which, when homozygous, gives seedlings with bright green hypocotyls; no crossing over was detected in twenty gametes tested for linkage. Lines heterozygous for green hypocotyls produced seedlings with green, light purple and purple hypocotyls; seedlings with green hypocotyls were homozygous for one *S* allele while those with purple hypocotyls were homozygous for the other *S* allele. The hypocotyl gene appears to be too infrequent, however, to be of any great value for the direct recognition of *S* allele homozygotes in inbred lines.

In the small number of families studied so far, self compatibility was determined by a gene unrelated to the *S* allele system. In one line, however, interaction occurred between the self-compatibility gene and the *S* allele system so that self compatibility, though dominant, occurred only in the absence of the dominant *S* allele. Tests for homology between *S* alleles from different inbred lines indicated that homology occurs most frequently among *S* alleles low in the dominance series. Tests on commercial stocks suggest that the total number of different *S* alleles in marrow-stem kale is limited.

Beans. In studies on cytoplasmic male sterility in *Vicia faba*, three families were obtained from a line which showed promise as a restorer. Selection for restoring ability continues, and the first crosses were made to determine the inheritance of the character. In Mendelian male-sterile strains, attempts are being made to detect linkage between this and other characters. In yield trials, hybrids based on Mendelian types were generally superior to those based on cytoplasmic types; both groups, however, included lines outyielding Garton's SQ and Throws MS. It was confirmed that a higher percentage of crossbreds occurs in the progenies of inbreds than in those of hybrids. In varietal crosses, Suffolk Red showed superior general combining ability in terms of yield and most of its hybrids showed an improvement in flowering date.

4270 **Report of the Rothamsted Experimental Station for 1960 (1961)** : Pp. 329.

The following investigations have a bearing on the genetical improvement of crops:—

Barley. Further experiments were carried out on the part played by disparities in photosynthetic capacity in differences in yield between Proctor and Plumage Archer [cf. 157].

Among the aspects investigated were (1) the effects of shading the ears upon yield per ear, 1000-grain weight and grain number and (2) rates of CO_2 uptake in photosynthesis and of respiration by the different plant parts.

Red clover. Seventy-one mutants of *Rhizobium trifolii*, obtained after various selective procedures, were examined for nutritional requirements, phage and streptomycin resistance, serological type and symbiotic effectiveness. The only nutritional mutant found was a strain not requiring thiamin, arising through exposure to ultraviolet radiation. Of 51 mutants resulting from ultraviolet and streptomycin treatment, only three were ineffective in fixing nitrogen, and none was phage resistant or serologically changed. Phage differed from the other selective or mutagenic agents in that a high proportion of the resistant mutants also differed from the parent strain in symbiotic properties, an association between the appearance of phage resistance and ineffectiveness being detected. The rates of mutation to phage and streptomycin resistance were calculated.

Potato. Further investigations on haulm and tuber resistance to *Phytophthora infestans* included the following. (1) In a field experiment, Ackersegen, Majestic, Arran Viking and Pimpernel were compared for haulm resistance, the last-mentioned variety having been found to be the most resistant variety in laboratory tests in 1959. Pimpernel was defoliated more slowly because the leaflets were infected more slowly and also died more slowly after infection. Sporulation differed significantly on the four varieties, mean width of the sporing annulus being lowest in Pimpernel. (2) Work was initiated to assess the accuracy of estimating haulm resistance by peroxidase activity. Of 41 clones tested, 10 Mexican selections reputed to have high levels of field resistance had the greatest peroxidase activity. (3) In laboratory tests, wound-free tubers were infected through eyes and lenticels by spraying the tuber surface with inoculum. Preliminary tests indicated that Arran Banner and Ulster Ensign were more readily infected by this method than Up-to-Date and King Edward and that infections on Arran Viking and Majestic tubers were often arrested at an early stage. (4) In cooperation with the John Innes Institute, the differential reactions of the haulm and tuber to six races were studied in genotypes R_1, R_2, R_3 and R_4. The races either provoked a hypersensitive reaction of the leaves or infected and spread in the leaves. R_1 conferred a hypersensitivity on the tubers comparable with that in the leaves, whereas the other three genes often did not. Races causing a hypersensitive reaction in leaves of R_2, R_3 and R_4 clones grew in the tubers, although more slowly than in hosts without these genes. Tubers of most clones, except Orion (R_1) and Reaal (R_1, R_3), were highly susceptible to races capable of spreading in the leaves.

Tests with 39 populations of *Heterodera rostochiensis* from the United Kingdom showed that 43% of the populations were mainly biotype A, 15% mainly biotype B and the remaining 42% mixtures of A and B. Both biotypes reproduce successfully on commercial varieties. A reproduces on resistant varieties bred from *Solanum multidissectum* but not on those derived from *S. tuberosum* and ssp. *andigenum*. The reverse behaviour holds for B. A long-term experiment in a field at Woburn, mainly infested with A, is under way to test the effect of growing ssp. *andigenum* hybrids on the soil population. Continuous cultivation of a resistant variety is being compared with continuous cultivation of some commercial varieties and with rotations which include the resistant variety and Majestic in different proportions.

Sugar beet. In tests in several localities, experimental varieties selected for tolerance of yellows seldom exceeded or equalled commercial varieties in yield, in contrast to the results in the relatively dry year 1959, when yellows occurred early and aphids were prevalent.

Hop. Investigation of genetic recombination and of the inheritance of hypha colour in *Verticillium albo-atrum* continued.

Pea. F_4 lines from the "second back-cross between the garden pea varieties Greenfeast (syn. Lincoln) and New Era", introduced from the Waite Institute, South Australia, were grown at Coggeshall, Essex, in a field heavily infested with *Fusarium oxysporum* f. *pisi* race 1. Of seven lines selected for homozygosity for resistance to South Australian race 2, six were fully resistant at Coggeshall and the seventh showed uniform partial wilting. F_2 data suggested that the parental strain of Greenfeast, selected in New Zealand for resistance to race 1, and New Era have a common gene or closely linked genes for resistance to race 1.

4271 Report of the Agricultural Research Council for the year 1959–60 (1961) : Pp. 209.

The report contains résumés of the investigations carried out during the year under review at agricultural research institutes and units in

England, Wales and Scotland, including those entirely or partly concerned with crop breeding and genetics. Among the aspects of agricultural research singled out for special discussion is a general evaluation of mutation breeding.

Fifty-first Annual Report of the John Innes Institute, Bayfordbury, Hertford 1960 : Pp. 48.

4272 *Williams, W. Department of Plant Breeding.* (*pp. 7–17*).

Apple. Attention is drawn to the fact that most of the selections made during the past decade are derived from either back crosses to one of the parents, usually Cox's Orange Pippin, or from crosses of half sibs.

The partial dominance of small fruit is the only exception to an intermediate expression of quantitative characters in F_1 hybrids. It is supposed that the anomaly is the consequence of selection. Directional dominance of alleles for small fruit would explain this exception.

Studies initiated to determine the relationships between chemical constituents of leaf and stem tissue and fruit characters have already given encouraging results. Investigations along these lines may offer a means of detecting, in the vegetative stage, seedlings which would have undesirable fruit characters.

Pear. In breeding during 1950–60, Doyenné du Comice has been the outstanding parent, with Glou Morceau and Beurré Hardy taking second place. An unexpectedly high number of triploid seedlings have proved to be attractive selections, although having large fruits. While opinions on the merits of large fruits in pears remain as vacillating as at present, difficulty may however be experienced in assessing the potential commercial value of these seedlings.

Cherry. Of the more recently developed selections, those derived from mutant, self-fertile forms are noteworthy.

Artificial-inoculation tests confirmed the grouping of varieties for resistance to bacterial canker (*Pseudomonas mors-prunorum*) according to the earlier results with natural infection [cf. 1362]. Seedlings derived from susceptible parents, such as Bigarreau Napoléon, are generally highly susceptible. *Prunus mahaleb* proved to be immune and *P. fontanesiana*, a supposed hybrid between *P. avium* and *P. mahaleb*, highly resistant. Susceptible varieties harbour large populations of the bacteria on the under surface of the leaves, localized on the hairs around the veins. The relationships between hairiness, population size and resistance are being further investigated.

In work on dwarf *P. avium* as a rootstock, about 55% of the varieties in the collection at the institute have been found to be heterozygous for the dwarf mutation. Production of large amounts of seed from compatible pairs of heterozygous varieties grown in isolation could be a first step in the practical exploitation of the dwarf mutation.

Strawberry. A survey was made of races of *Phytophthora fragariae* present in two fields of Surprise at Tiptree, Essex. Thirteen isolates were tested against ten varieties, each known to be resistant to one race. The isolates represented 11 races, six of which attacked all 10 testers. Instead of breeding for immunity, selection should therefore be directed towards attaining levels of field resistance similar to those already found in Cambridge Vigour. Experiments designed to study the rate at which new races are produced from a single race and from a mixed population of races, when infecting various varieties, were initiated.

Rubus. In the tetraploids ($2n = 28$) *R. caesius*, *R. calvatus* and *R. laciniatus*, all embryos developed from egg cells which were the products of normal meiosis but in which chromosome doubling occurred by some undetermined means. A small family resulting from selfing Pyne's Red Cross comprised four sex types (☿, ♀, ♂ and neuter) which corresponded with the sex forms described by Crane and Lawrence [II, 19], but the range in variation was such that none of the types was clearly defined. Moreover, the association between leaf form and sex class was far from absolute, males and neuters having either obtuse trifoliate or acute pinnate leaf forms. The evidence from this family is thus opposed to a simple explanation of sex control, as suggested by Crane and Lawrence.

Tomato. Both day length and temperature had influenced the length of style in relation to that of the anther column, as indicated by determinations of the ratio of carpel length to stamen length. At 65° F., the ratio was 1·00 with short days (8 hr.) and 0·96 with long days (16 hr.), the difference being significant. With 16-hour days the ratio was 1·01 at high temperature (70° F.) and 0·84 at 57° F. The lower the carpel/anther ratio the higher was the amount of fruit setting following autonomous selfing. In addition, observations on hybrids between forms with inserted and exserted stigmas indicated that stigma position has a strong genetic component, with no dominance. The hybrids have frequently produced only parthenocarpic fruit under short-day conditions in heated glasshouse. In view of these findings, use of the genetically controlled, long-style character in combination with "self-emasculating" recessive mutations such as "positional sterile" (*ps*) may no longer be considered to offer a satisfactory technique for the commercial production of hybrid seed. Furthermore, these results suggest an explanation of the possession of exserted stigmas by *Lycopersicon* species in their natural habitats. In warm subtropical regions, natural selection, through the agency of pollinating insects, and phenotypic response to short days and high temperature have encouraged an outbreeding floral mechanism.

No evidence was obtained from an analysis of several quantitative characters that F_1 hybrids between inbreds differ from their parental lines in ability to buffer variability caused by the environment. Tomato hybrids thus do not possess higher degrees of uniformity such as those which have contributed to the success of F_1 hybrids of maize. It may be concluded that the pattern of variability of pure lines and hybrids of inbreeding species, where there is no inbreeding depression, is quite different from that found in outbreeders.

X irradiation of pollen of Best of All induced a disproportionately high number of breaks involving chromosome 2. In general, the majority of the breaks which gave rise to translocations originated in the chromatic regions of the chromosomes.

Work on tobacco mosaic virus has two aims: (*a*) development of resistant breeding lines of tomato and (*b*) analysis of host-virus interaction. Among the results from (*b*) are the following. (1) Infectivity on tomato, as measured by the *Nicotiana glutinosa* assay method, varied directly with concentration of inoculum. Infected sap, diluted to a concentration of 10^{-4}, gave very little infection, except in the most susceptible varieties. (2) The resistant genotype Z546, derived from *Lycopersicon hirsutum* and previously described as a symptomless carrier, evidently possesses a high degree of resistance to infection and can also inhibit viral replication.

The occurrence of "silver sector" in varieties such as Baby Lea, Potentate and Ware Cross may, it is speculated, be associated with chromosome breakage induced in the meristem by some environmental factor.

Resistance to *Cladosporium fulvum* has been introduced into lines of seven commercial varieties, using one source of resistance derived from *L. peruvianum* and another originating from *L. pimpinellifolium*. The lines may be used directly, as resistant forms of the varieties, or as parents of resistant hybrids. Stocks of Vetomold, Kondine Red, Stonor's Exhibition, Ailsa Craig and JI10 incorporating the markers *c* (potato leaf) and *a* (anthocyaninless) have been developed, after a minimum of five back crosses. These stocks may also be utilized in producing F_1 hybrids, in combination with standard varieties or *Cladosporium*-resistant lines. Use of these marker stocks should facilitate the certification and authentication of hybrid seed.

4273 *Fincham, J. R. S. Department of Genetics. (pp. 18–25).*

Further investigations on the effects of mutation on glutamic-dehydrogenase production in *Neurospora crassa* and on the genetics of mating type in *Coprinus lagopus* are reported. *Ustilago maydis* was also studied, with regard to mitotic crossing over, mating system and cytology. Pathogenicity and fertility in this fungus are not distinguishable. Infection and production of brand spores in the host are under the control of two loci: *a*, with two alleles, and *b*, with multiple alleles. Haploids are compatible if they carry different alleles at both loci; diploid strains heterozygous for both loci are self fertile or solopathogenic. A functional distinction between *a* and *b* was demonstrated. An interaction between different *a* alleles was essential for dicaryon formation but unnecessary for pathogenicity, which appeared to be under the control of *b*. The multiple alleles controlling pathogenicity could have evolved separately, it is suggested, from the simple two-allele mating system common to most smuts. Two chromosomes were observed in a haploid of *U. maydis*, four in a diploid.

4274 *Simmonds, N. W. Department of potato genetics. (pp. 26–35).*

An extensive collection of cultivated diploids was made on an extensive expedition to S. America. Surveys of the collection for morphological variability and distribution of alleles at loci controlling anthocyanin production, morphological features and the breeding system were initiated. "Indigenous" tetraploids in Chile were also collected, mainly for their interest in relation to the controversy concerning the origin of *Solanum tuberosum*.

In further work on the experimental taxonomy of cultivated diploids, families were raised by crossing in pairs representatives of the "species" *S. stenotomum*, *S. phureja*, *S. goniocalyx* and *S. yabari*, measurements being made of flowering time and two other floral characters, three leaf characters and tuber production. Within species variability was so great that there was much overlapping between species. The pigment types segregating in all families belonged to the *PRAc* system previously worked out for *S. phureja*. Over 200 diploid clones collected on the above-mentioned expedition, in an area ranging from Venezuela to southern Bolivia, contained only pigments characteristic of the *PRAc* system.

In wild diploids, no pigment variation is known which corresponds to that associated with loci *R* and *Ac* in the cultivated types. The blue-flowered wild forms correspond to the dominant *P* genotype, but the white-flowered forms do not behave as though they are *pp* in constitution; crossing with white cultivated clones (*pp*) thus gives coloured hybrids. *S. kurtzianum, S. simplicifolium, S. maglia, S. soukupii* and *S. chacoense*, for example, all yielded petunidin-containing hybrids. A study is being made of the genetic system controlling pigmentation in F_1 and F_2 hybrids between wild diploid species. *S. soukupii* has been found to contain myricetin. In this species, at least, the block in anthocyanin synthesis therefore differs from that brought about by *p* in cultivated potatoes.

Analysis of the breakdown of self incompatibility in cultivated diploids continued. The most self-fertile individuals in a selfed progeny of the *S. phureja* clone CPC979 ($S_{11}S_{12}$) were sib mated. The frequencies of self-fertile plants rose from 30% in the first generation to 95% in the second. Concurrently, the frequency of successful self pollinations of self-fertile plants also rose sharply, although the fertility of successful pollinations changed only a little, seed number per berry rising from 36 to 42 in the two generations, in comparison with about 250 seeds per berry for compatible crosses. Two unrelated tester clones of constitution $S_{11}S_x$ and $S_{12}S_y$ unrelated to CPC979 have been identified. By crossing the testers, individuals of the same *S* constitution as clone CPC979 were obtained. Reciprocal pollinations between such plants and CPC979 were successful only with the latter as ♀ parent. Breakdown of self incompatibility in CPC979 is thus primarily a stylar reaction.

Further work was carried out on interspecific relationships in the series *Conicibaccata, Demissa, Longipedicellata* and *Piurana*. Seed was obtained from crosses of (1) *S. oxycarpum* (4*x*) with *S. colombianum* (4*x*), *S. tuquerrense* (4*x*), *S. fendleri* (4*x*), *S. polytrichon* (4*x*), *S. demissum* (6*x*) and *S. hougasii* (6*x*) and (2) *S. santolallae* (2*x*) with *S. oxycarpum*. Two hexaploids produced by colchicine-doubling of 3*x* hybrids between *S. verrucosum* (2*x*) and *S. stoloniferum* (4*x*) were studied to elucidate evolutionary problems. Fertility of the hybrids was about only one-hundredth of that of the controls (*S. demissum* and *S. hougasii*) and was constant over the three generations studied (F_2–F_4). The F_4 hybrids were equal in vigour to the most vigorous plants of *S. demissum*. It may therefore be supposed that the hybrids could establish themselves vegetatively under natural conditions. Whether they could achieve evolutionary success depends on the balance between vegetative survival and seed reproduction and on the rate at which fertility improves under selection. The point is of importance in view of the probability that the 6*x* members of *Demissa* evolved as the result of doubling of 3*x* hybrids of *S. verrucosum, S. stoloniferum* and their near relatives.

Investigation of environmental variability in *S. stoloniferum* showed this to be considerable. Three commonly used diagnostic leaf characters were of dubious taxonomic significance.

According to the results of an identification of *R* genes in *S. stoloniferum*, this species shows the same genetic specificities towards races of *Phytophthora infestans* as *S. demissum*, suggesting that the two species had a common origin.

Further study of self incompatibility in wild species indicated that diploids *S. kurtzianum* and *S. simplicifolium* agree with their South American congeners in having one-locus systems and that the Mexican *S. michoacanum* also has such a system. In the Mexican sections *Pinnatisecta* and *Cardiophylla*, *S. pinnatisectum* and *S. ehrenbergii* have already been found to possess two-locus systems; new data suggest that *S. bulbocastanum* also has two-locus control. Since *S. michoacanum* is usually placed in *Pinnatisecta*, it appears that the two-locus system is not closely associated with either geographical distribution or taxonomy. Further analyses of the system in *S. pinnatisectum* have shown it to be highly complex; interactions between the loci are responsible for characteristics of sporophytic determination in an essentially gametophytic system. [Cf. 1364].

Two approaches are being explored in wide interspecific hybridization: (*a*) use of a wide range of parents on the assumption of intraspecific variability in crossability and (*b*) disturbance in the mechanism inhibiting pollen-tube growth. With (*a*), F_1 seed has been secured from *S. pinnatisectum* x *S. ehrenbergii*. With (*b*), premeiotic X irradiation of the pollen has apparently broken down incompatibility between *S. simplicifolium* and *S. chacoense.*

A hypersensitive response to inoculation with virus Y in *S. demissum* sometimes results in localization of infection but is frequently followed by systemic infection, ranging in extent from a few isolated necrotic lesions to widespread necrosis and then death. Hypersensitive seedlings from 40 progenies whose parents showed extremes in this behaviour were evaluated for extent of systemic infection ("escape score"). Escape scores for parents and progenies were correlated. The dominant Y hypersensitivity of *S. demissum* is known to lose penetrance in an *S. tuberosum* background. Evidently *S. demissum* "has not only a weak hypersensitivity allele but also a variable—generally weak—background in which it operates."

Survey of resistance to *Streptomyces scabies* in ssp. *andigenum* continued. In retesting of clones selected in previous artificial-inoculation tests as resistant, some clones again proved resistant but others were susceptible. The retesting showed the resistance of individuals to be associated with family performance.

In cooperation with Rothamsted Experimental Station, the late-blight resistance of tubers of *R* genotypes was determined [cf. 4270].

Chromosome numbers were estimated in late-blight resistant cultivars derived from *S. demissum* x *S. tuberosum.* Twenty-four clones had $2n = 48$ and two $2n = 49$. Blight resistance was not therefore associated with aneuploidy. Selection for agronomic quality apparently eliminated aneuploidy without detriment to resistance.

In breeding for combined resistance to late blight and virus Y, back-cross seedlings from *S. stoloniferum* x *S. tuberosum* which had survived screening in the glasshouse were tested under field conditions. The results from the field planting were much more informative as to general performance than those from the tests in the glasshouse.

With a view to (*a*) elucidating the mode of putative origin of *S. tuberosum* varieties of Europe and N. America from ssp. *andigenum* introductions and (*b*) assessing the possible value of locally-adapted ssp. *andigenum* lines in breeding, attempts have been initiated to breed *S. tuberosum* types by (1) pedigree selection from ssp. *andigenum* and (2) mass selection in large panmictic populations set up to sample as fully as possible the variability of ssp. *andigenum.*

The chemical nature and distribution of cinnamic acid derivatives in wild and cultivated species are under investigation.

4275 *Harris, H. Department of cell biology.* (*pp. 36–39*).

The following are among the investigations reported.

By a combination of autoradiography, interferometry and microspectrophotometry, applied to pollen grains of *Strelitzia reginae* and animal tissue, evidence has been obtained that the nucleolar material is maintained continuously throughout mitosis.

Autoradiographic analysis of mitosis in root tips by means of tritium-labelled thymidine led to the conclusion that the low Feulgen reactivity of heterochromatic segments in plants (unspecified) which have been exposed to low temperature is not explicable on the basis of impairment of DNA synthesis.

4276 SCHEIBE, A.
Der Anteil der Forschung an der deutschen Pflanzenzüchtung. **(The part of research in German plant breeding).**
Saatgutwirtschaft 1961 : Spec. Ed. 11–13.

The historical development of plant breeding and the cooperation between research and commercial breeding are described. Breeding began on the basis of private enterprise and is still privately controlled in Federal Germany. The research institutes help the breeders by developing new procedures and they also carry out testing of new varieties. Some firms however have their own research departments.

4277 Zusammenfassung 1960 mehjähriger Versuchsergebnisse von Getreide, Mais, Kartoffeln, Rüben, Luzerne, Rotklee. **(Summary of the results of several years' trials of cereals, maize, potatoes, beets, lucerne and red clover, 1960).**
Bundesanst. Pflbau. Samenprüf., Wien 1961 : Pp. 36.

The results of varietal trials held in different parts of Austria are presented in tabular form.

4278 MÖLZER, V.
Co připravují šlechtitelé polních plodin. **(What the breeders of field crops are doing).**
Za socialist. Zeměd. 1960 : **10** : 133–41.

Breeding at stations throughout Czechoslovakia is surveyed.

Cereals. The new spring wheat Ruzyně II [cf. 4463] has recently received official approval. At Branišovice some promising winter wheats have been bred, including I/v which equals or surpasses leading varieties in respect of yield; it is white-eared, awned and resistant to frost and lodging. This station has also produced 47R, a spring wheat resistant to black rust; it is awnless, white-eared and of high quality. The Čejč station has developed I56, a very productive winter wheat of above average quality; it does not lodge and is suitable for intensive cultivation. Another winter variety, 3/4 from Chlumec, is adapted to hilly country and is more productive than Chlumec 12, as well as being resistant to lodging and frost and having good baking quality. Studies of amphidiploids of wheat and rye are also being carried out.

Attempts are being made to produce oats with a short growing period and suitable for mountainous regions. The Chlumec station has submitted two new selections to the state trials, I/54 for high regions and II/54 for low regions; both yield more than Česky zlutý [Czech Yellow] and are resistant to diseases and especially to loose smut.

Much attention is being paid to breeding for *Fusarium* resistance in rye. The Hrudkov station has a selection which gives fair yields in the mountains and escapes rust on account of its earliness. Some progress has been made in developing a short-stemmed rye at Dětenice.

Some maize hybrids have been produced at Čejč. These include W255, an early hybrid suitable for ensilage in cool districts. The medium-early hybrid W355 is suitable for grain production and has outyielded other cultivated hybrids. The white-grained hybrid M706 is also medium early and is adapted to dry regions; it can be used for ensilage in beet-growing areas. Another medium-early hybrid, M15, is adapted to conditions in southern Slovakia and is suitable for ensilage.

The spring barley Branišovice C has been officially approved; it is high yielding, relatively resistant to lodging and of good malting quality. The Čejč station has produced F56, a very promising barley which does not lodge and is suitable for intensive cultivation; it has good malting quality.

Leguminous forage plants. The Branišovice station has submitted a new lucerne, with a high content of digestible protein, to the state trials. The Čejč station has a very productive and long-lived selection on trial and the Domoradice station has selected a lucerne for submontane regions; it gives three good cuts per year. Some promising selections of clover have also been obtained. Two selections of sainfoin have given good results; one of these does well on sandy soils and is suitable for southern Slovakia. A new selection of spring vetch at Čejč gives high yields of green matter and seed. Forage varieties of *Pisum arvense* and *Vicia faba* are also being bred.

Flax. The variety Wiera has given high yields and is resistant to disease and lodging.

Potato. The recently approved variety Vltava from Vyklantice is a semilate to late potato giving high yields and showing resistance to late blight in foliage and tubers; it is not attacked by scab; it is suitable for culinary and industrial use. The Vyklantice station has also developed five promising hybrids; three of these have a high starch content.

Sugar beet. Breeding for resistance to *Cercospora* is under way and polyploids are being developed.

Poppy. The new hybrid HD (Hanácký modrý [Hanácký Blue] x Dětenický bělosemenný [Dětenice White-seeded]) from Ruzyně gives a seed yield 20% higher than that of other approved varieties. The dark blue seed has a high oil content. This variety shows considerable resistance to *Helminthosporium*. At Chlumec attempts are being made to combine the good qualities of Dubský Stříbrošedý [Dubi Silver Grey] with the blue seed colour of other poppies.

Vegetables. Mention is made of promising new varieties of swede, Jerusalem artichoke, lentil, bean and pea.

4279 Korohoda, J. & Kossowski, M.
Prace Zakładu Roślin Pastewnych i Traw IHAR w Puławach. (**Work of the Division of Forage Plants and Grasses of the Institute of Breeding and Acclimatization in Puławy**).
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 6–16. (Mimeographed).

Maize. Two maize varieties have been produced: Żółty Puławski [Puławy Yellow], a flint type possessing medium yielding capacity, tolerance of light frosts and freedom from lodging, and Ryżowy Puławski [Puławy popcorn], the only Polish popcorn, which gives high yields of green matter.

Forage plants. Some hardy forms with high yield have been produced from crosses of *Medicago sativa* x *M. falcata*. Useful selections have been made from *M. lupulina*.

Studies on local populations of *Pisum arvense* have revealed the possibility of breeding winter types, some forms having withstood temperatures of — 34° C.

4280 X-lecie pracy Instytutu Hodowli i Aklimatyzacji Roślin 1950–1960. **(Ten-years' work of the Institute of Breeding and Acclimatization, 1950–60).**

Biul. Inst. Hodowl. Aklimatyz. Roślin 1960 : No. 2 (35) : Pp. 80.

The work of the central institute has included breeding interline hybrids of maize for growing in Poland for both silage and grain, the production of the Ludowe rye, said to be the best rye in Europe, crossing rye with *Secale montanum*, *S. vavilovii* and other species, and the production of hybrids of various cereals, sugar beet and forage plants, oil crops, vegetable and ornamentals. The varieties produced include 5 ryes, 1 pea, 4 other vegetables and 6 potatoes. The plants on which work is in progress include, in addition to those mentioned below, *Dipsacus fullonum*, *Sorghum technicum*, *Salix* spp., *Abutilon avicennae* and a number of vegetables.

Details are given of the organization and work of the various sections and substations attached to the institute.

Cereals. Reference is made to hybrids of *Triticum aestivum* x *T. spelta* with increased protein content, to a selection of the malting barley Kneifel with low protein content, to a selection of the malting barley PZHR with improved quality and to promising hybrids between this variety and Golden Grain. A selection of the six-rowed winter barley from a local population from the Kraków area has been released and several other winter-barley selections and hybrids are mentioned, some two-rowed, some six and some four. A new oat, *Avena sativa* 'Puławski Nagi' [Puławy Naked] has been released and other new cultivars include two of *Panicum mileaceum*, one of *Fagopyrum esculentum* and several of maize; the best hybrid combinations in maize have proved to be Wielkopolanka x Wigor and Małopolanka x Dar Północy [Northern Gift] and they have been released under the names Wiel-Wi and Ma-Dar.

Forage plants. Observations have been made on field peas, vetch, lupins, *Trifolium* spp., *Ornithopus sativus*, fodder rye and a large number of grass species.

One of the varieties mentioned is the lucerne Mieszańcowa Puławska [Puławy Hybrid], produced from crossing *Medicago sativa* x *M. falcata*. Some of the northern lucerne ecotypes have proved superior to the breeders' varieties.

Potato. Three blight-resistant varieties have been produced, Wulkan and Epoka being resistant to all races of *Phytophthora infestans* except 3,4, and Ewerest having field resistance, combined with resistance to virus Y and high yield. Other new varieties produced are Flisak, a culinary variety resistant to leaf roll and relatively resistant to virus Y, giving high yields of large tubers; Flora, an industrial variety relatively resistant to virus Y and tolerant of leaf roll, giving record yields under good conditions; and Lawa, an industrial variety combining resistance to virus Y with medium resistance to leaf roll and blight.

Sugar beet. The first Polish polyploid variety Poly IHAR was released in 1959 and others are on the way, one of them being a monogerm form, Poly-Mono-IHAR. A bigerm diploid, Bi-IHAR, has also been produced.

Oil crops. Several winter varieties of swede and turnip rape have been produced, some by selection, some by crossing. Crosses have also been made between spring and winter swede rape.

Poppy hybrids with a high morphine content have been produced, their mean alkaloid content amounting to 0·45%.

The oil sunflower Borowski IHAR is characterized by low stature and earliness. A fodder sunflower, Olbrzym Borowski IHAR [Giant Borowski Institute of Plant Breeding and Acclimatization], has also been produced, as well as varieties of soya bean, white mustard, oil radish, safflower, linseed and oil pumpkin.

Vegetables. A canning pea, Syrenka Konserwowy, has been produced and several others are under observation.

An outdoor tomato, Karzelek Puławski [Puławy Dwarf], distinguished by high yielding ability, has been produced and another, possessed of earliness, dwarf habit and high yield, is in the last stages of testing. Two F_1 tomato hybrids will also soon be ready for release; the F_1 hybrids have proved more tolerant of unfavourable climatic conditions.

Spinach and onion lines are being selected, preparatory to the production of F_1 hybrids.

Nemesített növényfajtákkal végzett országos fajtakísérletek eredményei 1959. **(Results of the national varietal trials of improved crop varieties, 1959).**

Budapest 1960 : Pp. 311.

4281 *Kapás, S. Növényfajtaminősítő tanács titkársága 1959. évi munkájá. (The work of the secretariat of the council for the evaluation of crop varieties during 1959). (pp. 3–38).*

Notes are given on the results of trials of

cereals, potato, sugar beet, sunflower, soya bean, flax, forage legumes and vegetables, and on the varietal disease resistance of some of these crops. The following varieties showed promise: the winter wheat Fertődi 293 continued to do well [cf. 173]; the millet Fertődi 2, the linseed Olajözön [Oil Torrent] and the lettuces Soroksári and Budai hajtató [Buda Forcing], all of which have received provisional state certification; the three early cherries Pomázi hosszúszárú [Pomázi Long-stalked], Dunabogdányi korai [Dunabogdány Early] and Gyöngyösi szívcseresznye [Gyöngyös Heart cherry]; the attractive, well-flavoured apricot Kécskei rózsa [Kécske Rose]; and the grape varieties Irsay Olivér, Gloria Hungariae, Kocsis Irma, Pannonia Kincse [Treasure of Pannonia] and Mócsai Mariska, all provisionally state certified.
Among winter wheats, Fertődi 293 showed low susceptibility to mildew and leaf rust. The early tomato Kecskeméti törpe [Kecskemét Dwarf] and the canning variety Kecskemét 42 were the least attacked by viruses, and a hybrid between the two showed a low incidence of *Septoria lycopercici*, as did Kecskemét 3; Kecskeméti korai [Kecskemét Early] was the most resistant to *Alternaria solani*. Among late cabbages, the least susceptible to *Alternaria brassicae* was E5.

4282 *Tomcsányi, P. & Wellisch, P. Gyümölcs- és borfajták organoleptikus vizsgálati módszere.* (*A procedure for organoleptic testing of fruit and wine varieties*). (*pp. 85–109*).
Details of the tasting procedure used in evaluating large numbers of varieties of wine or grapes are given. A scoring system in which characters are weighted according to their importance is employed. Samples are randomized, two replications being recommended for wines, three or four for grapes; in both cases the testing panel should consist of 20–30 judges.

4283 *Papp, Zs. Őszi búza* (Triticum aestivum *f.* hybernum *L.*). [*Winter wheat* (T. aestivum *f.* hybernum *L.*)]. (*pp. 111–35*).
Fertődi 293 has maintained its leading position in trials of 13 varieties conducted at various stations during 1957–59 [cf. 176].

4284 *Kapás, S. & Kelemen, I. Kukorica* (Zea mays *L.*). [*Maize* (Z. mays *L.*)]. (*pp. 137–55*).
Data on yield trials of 11 open-pollinated varieties and six hybrid varieties are presented, together with data from earliness tests involving 11 varieties and hybrids. Mv1 was the most prolific in both years of testing (1958 and 1959).

4285 *Csák, Z. Burgonya* (Solanum tuberosum *L.*). [*Potato* (S. tuberosum *L.*)]. (*pp. 157–85*).
In trials conducted in 1957–59, Sárga kifli [Yellow Kidney], developed from Korai rózsa [Early Rose] x Kifli [Kidney], was the most productive of five early varieties; Somogyi sárga [Somogy Yellow], from Margit x Edelgard, the most prolific and most blight resistant of 13 midseason varieties; the selection K263 (Aranyalma [Golden Apple] x Zalán) the highest-yielding of 12 medium-late potatoes; and Capella (= Lenino) the best of six late varieties.

4286 *Hinfner, K. A burgonyafajták és fajtajelöltek rezisztencia vizsgálatának eredményei az 1956–59. évi országos és provokativ kísérletek alapján.* (*Results of the resistance test of potato varieties and varietal selections on the basis of the national and preliminary trials of 1956–57*). (*pp. 187–219*).
Data are presented on the resistance of 38 varieties to viruses, leaf and tuber blight, *Streptomyces*, *Rhizoctonia*, *Spondylocladium*, internal rust spot, grey spot, *Ditylenchus* and irregular tuber formation.

4287 *Kiss, A. Cukorrépa* (Beta vulgaris *var.* saccharifera *Alef.*). [*Sugar beet* (B. vulgaris *var.* saccharifera *Alef.*)]. (*pp. 221–38*).
Among 14 varieties tested in 1957–59, the polyploid BETA poli varieties were again superior in root yield, digestion, sugar yield and *Cercospora* resistance to the diploid varieties [cf. 183].

4288 *Bakos, Zs. Olajlen* (Linum usitatissimum *L.*). [*Linseed* (L. usitatissimum *L.*)]. (*pp. 239–56*).
Of nine varieties tested in the Transdanube and Alföld regions, the state-certified variety Olajözön [Oil Torrent], from Bolgár Karbonat [Bulgarian Carbonate] x Beta 201, gave the highest seed yield and oil yield in both areas, closely followed by Reziszta and Szegedi Alfa.

4289 *György, K.* (*Mrs.*). *Olajlenfajták resisztencia vizsgálata.* (*Study of the resistance of linseed varieties*). (*pp. 257–74*).
Data are given on the incidence of *Septoria linicola*, *Colletotrichum lini* and *Polyspora lini* on nine varieties grown at different localities in 1956, 1957 and 1959. Olajözön [Oil Torrent]

had the lowest total incidence of disease (14·5%) over the three years and Szegedi Alfa the highest (33·0%). The relative frequencies of the three diseases varied with year, variety and locality.

4290 *Komjáti, I. Paradicsom* (Solanum lycopersicum *L.* Lycopersicum esculentum *Mill.*) *1955–56–57–58.* [*Tomato* (S. lycopersicum *L.* L. esculentum *Mill.*) *1955–56–57–58*]. (*pp. 275–307*).

Three greenhouse varieties (1), ten early outdoor varieties (2) and ten canning varieties for outdoor growing (3) were tested in 1957–58; five other early varieties were tested in 1955–56. In group (1), Budai törpe [Buda Dwarf] yielded most and Kecskeméti törpe [Kecskemét Dwarf] was earliest. In group (2), Kecskemét 42 x Kecskeméti törpe and Budai törpe were the most productive, and in group (3) the provisionally certified variety Kecskemét 42 gave the highest yields.

4291 Station Centrale de Génétique et d'Amélioration des Plantes. Rapport annuel 1959. **(Central Station of Genetics and Plant Breeding. Annual report 1959).** Versailles : Pp. 31. (Mimeographed).

Wheat. A number of colchicine-induced $2n = 56$ amphidiploids have been developed as a result of a programme involving *Aegilops ventricosa* and several $2n = 28$ *Triticum* spp. Stable, fertile $2n = 42$ lines have now been produced by repeatedly back crossing two of the amphiploids, *T. ventricopheevi* and *T. ventricococcum*, to the respective *Triticum* parents. Monosomic lines are being used in a study of the resistance of *T. aethiopicum* to *Cercosporella herpotrichoides*. Reference is made to various lines now undergoing multiplication. B21–3 is an early, cold-resistant variety susceptible to brown rust and *Oidium* but resistant to stem and yellow rust. Selection V81–12 is also described [cf. XXX, 3515].

Oats. Certain Rouge d'Algérie [Red Algerian] x Avoine du Prieuré [Priory oat] and Garry x (Avoine du Prieuré x Z45) winter-oat selections show a high level of resistance to *Oidium* and crown rust as well as winter hardiness equal to that of Avoine du Prieuré. Improved spring-oat selections, with resistance to lodging and to loose smut and crown rust, have also been obtained.

Maize. The aims of the breeding programme are discussed. Steady progress in yield potential was noted in visually selected progeny derived from crosses involving the American tester line HJ.

Barley. Studies on the precise timetable of cytological events resulting from colchicine treatment are reported.

Forage grasses. Attempts to develop drought-resistant *Lolium perenne* x *Festuca pratensis* hybrids continued. A high level of fertility was noted in the progeny of a cross between $2n$ *L. perenne* and a $3n$ form, in spite of considerable chromosomic recombination. The aims and present status of the cocksfoot breeding programme are described. Information is also provided on fescue and timothy breeding.

Lucerne. A programme for the development of improved double-cross hybrid lines is described.

Vetch. Mutant forms of Sylphie, induced by seed treatment with X rays and various chemical mutagens, are being studied.

Linum. Promising lodging-resistant flax selections include the progeny of CI687 x Wiera and (CI687 x KG) x Wiera. As regards linseed, reference is made to (47–1)9–5 x Chabut 10, a profusely spreading hybrid able to withstand weed invasion better than normal varieties. A high-yielding, lodging-resistant, white-flowered Moroccan selection has also shown promise. Attempts to hybridize *L. usitatissimum* with 15 wild *Linum* species were unsuccessful, except in the case of *L. angustifolium*. Partial embryo development was observed in crosses with *L. narbonense* ♂ and *L. grandiflorum* ♂.

Sugar beet. Lines yielding almost as well as commercial varieties but with resistance to *Cercospora* have been developed. *Beta vulgaris* x *B. maritima* hybrids were intermediate in both yellows tolerance and yield potential between the parental lines. Brief reference is made to studies on male sterility and polyploidy.

Rape. In varietal trials at La Minière, particularly good results were obtained from Alsace x Hambourg and Lembke x Orléans selections. An Alsatian line, Als.2(4)(5), was consistently richer in oil content than Valois, Sarepta and Hambourg in trials at five different centres. Mutant forms of this line, Sarepta and Hambourg, induced by chloro-2-ethyl methane sulphonate and ethyl sulphate, are described.

Pear. Irradiation studies on Max Red Bartlett indicated that the variety is a periclinal chimera.

Endive. Some improvement in homogeneity has been obtained as a result of self fertilization of certain lines. Dionne and Spicer's method was used to detect self-fertile plants.

French bean. The reaction of 50 lines to artificial infection by four races of *Colletotrichum lindemuthianum* was tested. *Phaseolus multiflorus* and Cornell 49–242 showed complete resistance to all races. A number of foreign and indigenous isolates of *C. lindemuthianum* were classified into 13 groups on the basis of the reaction of 12 differential hosts. The resistance of Bo19 and Nordstern [Pole Star] to *Pseudomonas phaseolicola* was confirmed by a new technique of artificial infection, based on the pod rather than on seedlings. Varietal differences in response to virus 1 are reported.

4292 Mayer, R.
Orientation actuelle de la sélection en France. (**Current trends in breeding in France**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 105–08.

A number of problems in the French plant breeding programme are discussed in general terms.

4293 Morice, J. & Plonka, F.
Les plantes oléagineuses et textiles: colza et lin. (**Textile and oil plants: rape and *Linum***).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 163–72.

General aspects of the rape and *Linum* breeding programmes in France are discussed, particular attention being paid to some of the more important varieties and to disease-resistance problems.

4294 Estación Experimental de Aula Dei. Departamento de mejora. Ensayos 1959–60. (**Experimental Station of Aula Dei. Department of Breeding. Trials, 1959–60**). Pp. 34. (Mimeographed).

Further investigations on the following crops are reported [cf. 190].

Wheat. Caspino 1 and Caspino 4 performed well on unirrigated land while San Bruno (L4 x Hope) gave good results under irrigated conditions. A number of ES Angelino x *Triticum timopheevi* 3540A and Simbar x Kruger selections are reported to be rust resistant.

Oats. Previsión is recommended for dry conditions, while Cartuja is recommended for irrigated land.

Sugar beet. The Aula Dei selections 645, 745, 842 and 8413 performed well in yield trials.

Turbin, N. V. (Editor).
(**Darwinism and genetics**).
Belgosuniv. V. I. Lenin., Minsk 1959 : **2** : Pp. 221. [Russian].

The volume, dedicated to the anniversary of the publication of the *Origin of Species*, comprises the following contributions.

4295 *Turbin, N. V.* (*The creative method of C. Darwin*). (*pp. 5–20*).

The strictly factual nature of Darwin's approach is extolled, as are the breadth of his vision and power of self criticism; the last attribute is compared, in its creative capacities, with selection in nature. His modesty is illustrated by extracts from his autobiography.

4296 *Turbin, N. V. & Vahtin, Ju. B.* (*Darwinism and genetic theories of heterosis*). (*pp. 21–39*).

[Cf. 1213].

4297 *Turbin, N. V.* (*The philosophical questions of modern genetics. I. On two directions in modern genetics*). (*pp. 41–70*).

The charges of false science, fideism and popery appearing in the Soviet press in connexion with the gene theory are examined. Eugenics is considered to be a misapplication of genetics, based on false premises. The same applies to social Darwinism. In regard to the gene theory it is pointed out that the facts on which it is based can be verified experimentally; some of the results obtained with *Drosophila*, micro-organisms and other organisms are cited, with an explanation of the way they have caused some of the basic principles of genetics to be modified; the recognition of the composite nature of the locus, the existence of extra-nuclear inheritance and the indirect action of mutagens has led to a unified view of the mechanism of inheritance in place of the original corpuscular gene concept. The role of nucleic acids in bacterial transformations, the demonstration of the infective capacity of virus nucleic acid and of the existence of different kinds of nucleic acid corresponding to different species and strains, the knowledge of the structure of DNA and its capacity for self duplication and the increasing interest in biochemical genetics are cited as further examples of modifications in the gene theory, all bringing genetics nearer to the possibility of producing directed mutations, though a mechanism for the inheritance of acquired characters in higher organisms has not yet been proposed.

4298 *Palilov, A. I., Mušinskaja, L. G. & Demidova, G. F.* (*Comparative study of the results of hybridization in lupin by the methods of supplementary pollination and isolated crossing*). (*pp. 71–98*).

Lupinus angustifolius 'Benjakonskij 714', characterized by brownish-green leaves, white flowers and seeds and other recessive features, was pollinated with *L. angustifolius* 'Benjakonskij 484', possessing the corresponding dominant features, at three stages of development of the flowers, with and without emasculation. When unemasculated flowers were pollinated in the bud stage, 66% of hybrids were obtained, when pollination was performed on fully opened flowers, 4·7%. The set of seed was roughly twice as great in these experiments as in pollinations of emasculated flowers. This, combined with the greater speed of operation, means that the length of time required to produce a given number of hybrids is 2·7–7·7 times less when emasculation is not used, provided the flowers are pollinated in the early stages.

The hybrid plants from the unemasculated plants, distinguished by the presence of dominant characters, were studied. They had higher seed yields than those from pollination of emasculated plants, the difference being from 4 to 61%. The hybrids produced without emasculation had higher seed yields than the uncrossed female parent used as control, whereas those from emasculated flowers were not always higher and sometimes lower than the control.

In the F_2 the proportion of individuals with and without pigment was roughly 3 : 1, with a slight excess of dominants. The F_2 progenies from the cross without emasculation had a significantly higher number of plants with the maternal characteristics than those from emasculated flowers, the difference being from 8·56 to 11·42%. In the hybrids produced without emasculation 14·3% showed no segregation in the F_2, whereas in those from emasculation only 4% failed to segregate. The seed set was increased in other lupins too by supplementary pollination of flowers that had already opened. This method is therefore recommended for practical breeding work. The almost normal segregation ratios observed in the present experiments are regarded as confirming the Mendelian principle of genic integrity and the deviations as proof that, side by side with this, the Mičurinist principle of zygotic integrity is operative.

4299 *Palilov, A. I., Dubrova, V. P., Karabanova, T. A. & Vasilevskaja, T. K.* (*The nature of the effect of supplementary pollination*). (*pp. 99–131*).

Flowers of various pea cultivars were pollinated at the normal time and then again 48 hr. later, when the embryos were expected to have reached the 3–4 cell stage. Increases of seed yield varying from 10 to 311%, with a mean of 60%, were produced by the supplementary pollination. In some cases the seeds were larger, differences of 20–32% being observed.

When the seed parent, which was chosen with a number of recessive characters, was pollinated the second time with a variety possessing the corresponding dominant characters, 6·11% of the progeny proved to be hybrids; these plants are considered to be the products of fertilization of ovules that had remained unfertilized after the first pollination. Their number is however not sufficient to account for the whole of the increase in seed yield.

Supplementary pollination of *Lupinus angustifolius*, *L. luteus* and *L. albus* 2–3 days after the initial pollination resulted in increases in seed yield varying from 6 to 183%, with a mean of 61·6%. Corresponding increases in *Phaseolus vulgaris* were from 33 to 464%, with a mean of 76%. In these experiments too the proportion of hybrid seedlings was only 3·64% for the lupins and 0·5% for the beans, which is not enough to account for the increases in seed production. With barley a mean increase of 21% was obtained in yield of grain, though there was no increase in the number of grains per ear. Experiments with tomatoes, flax, poppy and *Nicotiana rustica* gave results similar to those with lupins and beans.

Figures are presented showing that whereas one supplementary pollination gave an increase of 11·4% in grain yield, progressively greater increases were produced when the pollination was repeated on successive days, six pollinations giving an increase of 31·2%, again without any increase in number of grains. Experiments with most of the species used showed that increases in seed yield were not so great when the supplementary pollination was performed at the time when the flowers were shedding their own pollen as when it was carried out before or after this stage, either of which treatments prolongs the period during which the physiological effects of germinating pollen are being exerted on the flower. The improvement was often just as great when supplementary pollination was effected with pollen of the same plant, another plant of the same species or a plant of another, but related, species. Pollen from distantly related species and genera had a favourable effect however only when applied after the flower had shed its own pollen and when applied earlier generally reduced the seed yield.

The F_1 plants from pollinations that gave an increased seed yield also showed improvements in seed yield amounting to 10% in barley, 43%

in *L. angustifolius*, 15–47% in *Ph. vulgaris* and 13% in peas. Such improvements in the F_1 were often absent when the supplementary pollination had been performed after 2 days or more. No improvements at all were observed in any of the F_2 families examined.

Plants of *L. angustifolius* having white flowers and seeds when emasculated and pollinated with the corresponding dominant gave an F_2 with a ratio of 1 white : 3·84 coloured. When after 24 hr. supplementary pollination was effected with the parent having the dominant characters the ratio was 1 : 3·93 and when effected with the recessive parent 1 : 3·26, although all plants of purely maternal type had been discarded in the F_1. This effect is thought to result from metabolic influences exerted by the pollen grains on the developing embryo rather than by their direct participation in the fertilization process. Hybrids obtained from supplementary pollination of unemasculated flowers also had an excess of plants of the maternal type in the F_2 and also of families that did not segregate [cf. 4298].

4300 *Alehnovič, V. S.* (*Influence of supplementary pollination of barley on the yielding capacity of the seed progeny*). (*pp. 133–42*).

Supplementary pollination of two-rowed barley, effected by moving a cord across the crop before or during the earing period, caused increases in number of grains per ear and size of grain. The progeny from the grains produced also had higher grain yields, the amount varying from 1·9 to 26·0%, according to the time at which the supplementary pollination was carried out, the mean being 16%. On the other hand, manipulation after ear emergence had an unfavourable effect.

4301 *Dubrova, V. P., Želudeva, V. P. & Kondyleva, T. S.* (*The role of the maternal organism in distant hybridization in wheat*). (*pp. 143–58*).

Figures are presented showing that the grain set was higher in crosses of *Triticum durum* x *T. aestivum* than in the reciprocal cross, the differences, which varied from 32·0 to 38·7%, being statistically significant. The size of grains was also higher, though the germinating capacity and the survival of the hybrids were higher in the reciprocal. The hybrids from *T. durum* had slightly more grains per ear than the reciprocals; they gave better sets when pollinated with *T. durum* whereas those from *T. aestivum* were better when pollinated with *T. aestivum*.

Higher sets were obtained when hybrids were used as parents. Thus *T. aestivum* 'Lutescens 62' x *T. durum* 'Melanopus 69' gave a set of 7·8% and the hybrid Durable x Lutescens 62 when pollinated with Melanopus 69 gave a set of 47·0%. The cross Melanopus 69 x Lutescens 62 gave a set of 53·5%, whereas that of Melanopus 69 x Hordeiforme 10 pollinated with Lutescens 62 gave 69·0%; the grains from the last cross weighed up to 43·4 mg. whereas those from Melanopus 69 x Lutescens 62 weighed only 29·2 mg. The weight of grains from 100 pollinated florets was also higher when hybrids were pollinated.

4302 *Dubrova, V. P., Dylenok, L. A. & Kaminskaja, L. N.* (*The occurrence of clear differences in fertility and vitality in interspecific hybrids of wheat*). (*pp. 159–75*).

Hybrids between *Triticum durum* 'Melanopus 69' and *T. aestivum* 'Kolhoznica' [Collective Farmer] are described. Out of 410 hybrids produced, 38 were distinguished by greater vigour, tillering capacity and fertility than the others. The proportion of such vigorous plants was greater in the progeny of crosses which had been subjected to one or other of two treatments, the first consisting in preliminary pollination of the seed parent with pollen of the male parent in the year before making the cross, the second in spraying the plants to be crossed with a 0·03–0·5% solution of boric acid. The chromosome number, $2n = 36$, was the same in both the typical and the luxuriant hybrids.

A larger proportion of the F_2 plants survived in the progenies of the luxuriant plants and the plants again had greater tillering capacity, vigour and fertility; their mean number of grains per ear was 18·3 compared with 14·9 in the F_2 from the typical hybrids.

4303 *Lobockaja, L. I.* (*Inheritance of some agriculturally important characteristics of habit in F_1 maize hybrids*). (*pp. 177–94*).

Three coefficients, viz. K_1 = weight of ear: weight of plant, K_2 = length : thickness of ear; and K_3 = height of attachment of ear : height of plant, were recorded in a number of crosses. K_1 was in some hybrids higher than in either of the parents, in some equal to one or other of the parents, in others intermediate and in some lower than either parent. In the hybrid H–301 x Bor'ba Ulučšennaja [Improved Bor'ba], K_1 exceeded that for one parent by 22·7% and the other by 74·3%. Though there was a correlation of $r = -0{\cdot}78$ between K_1 and height of plant in the hybrids as a whole, this hybrid proved one of the exceptions, having a height of 184 cm. compared with 148 and 176 cm. in the respective parents. Certain other exceptions also occurred. The position regarding the correlation between K_1 and total weight of plant was similar, though the correlation coefficients were generally rather lower. A correlation of — 0·68 was found between K_1 and length of vegetation period.

K_2 was higher than either parent in some hybrids. Thus in Severjanka [Northerner] x Jastrebinoe Gnezdo [Hawk's Nest], $K_2 = 6{\cdot}24$, that of the higher parent being 5·30, and in Severjanka x L–21, K_2 was 0·63 higher than that of the seed parent and 1·34 higher than that of the pollen parent. In other hybrids K_2 was equal to one or other of the parents or intermediate.

Some of the hybrids exceeded both parents also in K_3, one of the examples being VIR 15 [Institute of Plant Industry 15] x Bor'ba Ulučšennaja; the majority were equal to the higher parent. There was a correlation of + 0·58 between K_3 and plant height but great variations in the value of K_3 were observed in different hybrids of the same height and it should be possible to produce hybrids having a high ear insertion combined with earliness and low stature.

Some hybrids displayed heterosis in certain features but not in others. Thus Čakinskaja Žemčužina [Čakino Pearl] x H–301 exceeded the two parents in yield of green matter by 210–375 g. but in K_1 it was inferior to them by 0·023–0·045. Hybrid H–301 x Bor'ba Ulučšennaja exceeded the parents in both respects, by 110–285 g. in yield of green matter and by 0·048–0·11 in K_1.

4304 *Lobockaja, L. I.* (*Results of choice of varieties and lines for the production of early maize hybrids*). (*pp. 195–211*).

The results are given of experiments conducted at Minsk over the four-year period 1955–59 with 325 different hybrid combinations. Among the intervarietal hybrids, some of those derived from Verhovinskaja 239 were particularly promising, although this variety itself did not yield well at Minsk; the hybrid with Melkaja Hulinskaja gave a mean yield of air-dry ears 71% greater than that of the latter parent and 10–130% higher than that of the local standard, while ripening almost as early as Melkaja Hulinskaja. The hybrid Severjanka [Northerner] x Verhovinskaja 239 exceeded the former parent by 51%, the latter by 294% and the standard by 34% in yield of air-dry ears; the reciprocal hybrid exceeded the better parent by 81·5%, and combined this with a good yield of green matter. The hybrid Verhovinskaja 239 x VIR 1404 [Institute of Plant Industry 1404] exceeded the latter parent by 155% in yield of air-dry ears. Still higher yields were given by the hybrid Kičkasskaja x Mandorfskaja, which was however somewhat later in maturity. Some very promising hybrids were obtained by crossing early varieties with varieties from Abhazia; these hybrids germinated well at low temperatures, grew rapidly in the early stages, ripened early, often giving two ripe ears, and produced high yields.

Most of the hybrids with the best ear yields were flint types; flint x dent hybrids gave high yields of green matter but lower yields of grain, in which respect they showed little or no heterosis.

Of the top-cross hybrids the best yields were given by Severjanka x L–21, which exceeded the former parent by 59·5% and the hybrid Bukovinskij 2 by 75% in yield of air-dry ears; the hybrid is early and yields well even in unfavourable years. Certain other top-cross hybrids are also regarded as promising, one of these being H–301 x Bor'ba Ulučšennaja [Improved Bor'ba], which exceeded Bukovinskij 2 by 51% in yield of green matter and equalled it in yield of ears.

4305 *Kunickij, Z. A.* (*Study of the characteristic reaction of maize varieties to short day in connexion with the problem of the choice of parental pairs*). (*pp. 213–21*).

A number of varieties from different parts of the Soviet Union were grown in 1956–58 at Minsk under natural daylight and also under short days of 10 hr. All flowered sooner in the short photoperiod, though the degree of acceleration varied from 4 to 13·5 days according to variety. Contrary to expectation, varieties of northern provenance often reacted more strongly than southern varieties but wide variation occurred between varieties from the same geographical area.

In some varieties the earlier maturity in short photoperiods was accompanied by reduction in yield of ears and grain, in others by an increase, differences of up to 28% being reported. Varieties of the latter type are regarded as promising material for breeding.

4306 VARENICA, E. T.
(Some results of the work on breeding and mechanization).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 37–41. [Russian].

In an outline of the achievements of the

Agricultural Research Institute for the Non-chernozem Zone, several of the new varieties of cereals and other crops that have gained favour with the collective farmers are mentioned. They include the spring wheat Krasnozernaja [Red-grained] and a maize top cross from Voronež 80 x line VIR 27 [Institute of Plant Industry 27], the latter combining a yield of green matter equal to southern forms with the capacity to produce milk-ripe ears in the vicinity of Moscow.
Several selections of *Setaria viridis* combine reliable yields of grain and green fodder; early-maturing forms have been selected from crosses of *S. viridis* with *Panicum* and with *S. italicum.*
Amphidiploids produced by V. E. Pisarev from crossing spring rye x spring wheat have been back crossed to spring wheat and have given rise to some promising bread wheats containing up to 18% protein.
Winter forms of Ukrainka wheat produced by conversion have taken top places in the trials, giving grain yields of up to 50·7 c. per ha.
New machines described include a small-scale thresher for breeding work.

4307 ORLOVSKIJ, N. I.
(Let us communicate the details of breeding different crops).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 40–46. [Russian].

Mere details of parentage, without indications of the methods employed—whether individual or mass selection, crossing introduced forms, line crossing, supplementary pollination and so on—are considered insufficient in statements concerning the origin of cultivars. Studies of physiology, phasic development, reaction to diseases, problems of pollination and fertilization, combining ability and local adaptation have played an important part in breeding sugar beet and other crops. The fact that one variety occupies some 80% of the area under cotton in the USSR is regarded as a defect of Soviet plant breeding, whereas the production of monogerm sugar beets on a scale sufficient to sow 300,000 ha. in 1959 is counted as one of its most notable achievements.

4308 MUSIJKO, A. S.
(New work of the plant breeders).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 12 : 132–38. [Russian].

Conditions of vernalization, conversion of cereals from spring to winter forms, the influence of growing conditions on resistance to cold, drought, diseases and lodging, and vegetative hybridization are included in the work reported in this account of the activities of the Lysenko Breeding and Genetics Institute, Odessa.
Recent observations have confirmed the superiority of the winter wheats Odessa 21 and Odesskaja Bezostaja [Odessa Awnless], the early-maturing winter wheats 386/54 and 207/55, the winter-hardy winter wheat *Triticum durum* 'Mičurinka' and certain other promising winter forms of hard wheat.
The variety x line maize hybrid Odessa 23 is 5–6 days earlier than VIR 42 [Institute of Plant Industry 42], which it exceeds by 1·5–2% in yield; Odessa 27, from Voronež 76 x the hybrid Slava [Glory] is 10–12 days earlier than VIR 42, and Odessa 30, from (Voronež 76 x VIR 44) x (VIR 44 x Voronež 76), is still earlier and has exceeded VIR 25 in yield.
Several winter barleys have been released and a two-rowed winter malting barley will be ready in 1963.
The potato Odessa 24 (Courier x Ěpron) yields well in arid places, is wart resistant and has good cooking quality.
Other varieties produced include an early-maturing soya bean.

4309 ÁRNI JÓNSSON.
Skýrslur tilraunastöðvanna 1957–1958. **(Reports of the experimental stations, 1957–1958).**
Rit Landbúnaðardeildar : Ser. A 1961 : No. 15 : Pp. 92.

As in previous reports [cf. XXIX, 3537], data on the results of Icelandic varietal trials of grasses, barley, potato and turnip are included.

4310 6e Jaarverslag. Proefstation voor de Groenteteelt in de Volle Grond in Nederland. **(Sixth Annual Report. Experimental Station for Outdoor Vegetable Growing in the Netherlands).**
Alkmaar 1960 : Pp. 139.

In addition to the information summarized below, reports of varietal trials of strawberry, beetroot, celeriac, carrot, leek, cauliflower, Brussels sprouts, lettuce, Witloof chicory, cucumber, pea, French bean and broad bean are given.
Potato. Crossing and testing continued along the same lines as in previous years [cf. XXX, 2325].
Asparagus. Progenies of various land races and their crosses are under study. In andrecious lines the proportion of andromonecious plants varies according to line and is influenced by both male and female parents.
French bean. Several lines tested at Sloten

proved to have good resistance to stipple-stripe virus. Prelude x *Phaseolus dumosus* has yielded 39% anthracnose-free snap-bean plants in the F_3. Evidence from intervarietal crosses of slicing beans suggests that selection for anthracnose resistance in the F_2 may lead to the discarding of valuable genotypes and that selection in the F_3 may be more efficient. Good anthracnose resistance has been found in slicing beans with *Ph. coccineus* or *Ph. dumosus* in their ancestry.

Pea. A new dun pea from Aureool [Aureole] x Eroïca yields 10% less than Aureool, but the individual peas are rather larger and the cooking quality is good.

4311 NIJDAM, F. E.
Raszuiverheid en kwekersrecht. (**Varietal purity and breeders' rights**).
Zaadbelangen 1961 : **15** : 95–96.

In developing new varieties of self-fertilizing crops, breeders should strive for uniformity in as many qualitative characters as possible and limited variability in quantitative characters. Insufficient attention to these requirements in a variety may lead to difficulties in identification and disqualification for breeders' rights and will enable other breeders to select and register new lines from within the variety.

4312 Lijst van proeven en proefbedrijven van rijkslandbouwconsulenten, instituten en andere instellingen 1961. (**List of trials and experimental farms of national agricultural advisors, institutes and other establishments, 1961**).
Meded. LandbVoorlDienst, Wageningen 1961 : No. 78 : Pp. 126.

This list of the interprovincial trials planned for 1961 in the Netherlands includes descriptive notes on varieties of cereals, rape, pea, bean, flax, poppy and potato which have been entered in these trials but are not yet admitted to the official varietal list [cf. 4069].

MAHESHWARI, P. (Editor).
Modern developments in plant physiology. Report of Seminar held August 26th to 30th, 1957, India :
Pp. xi + 170.

4313 *Chinoy, J. J. Physiology of inheritance in crop plants. (pp. 130–33).*

The paper is concerned with the inheritance of quantitative characters in cereals (particularly wheat) and the correlations existing between all the major growth and yield characters and the length of the vegetative period [cf. XXVIII, 248–9, 1526]. It is argued that, since the growth, development and metabolism of the plant are correlated processes, and as these can be changed by altering the time of flowering [cf. XXVI, 1156], then there is no need to postulate the existence of numerous sets of genes to control these characters. It is suggested that early-flowering varieties differ from late varieties in having a greater ability to utilize external energy; this ability is termed the "heredity quantum".

4314 *Sen, B. & Joshi, H. C. Relation between permeability of the plasma membrane and resistance to parasite. (pp. 150–52).*

Studies on the leaves of seven wheat varieties showed that the percentage increase in membrane permeability induced by electrical stimulation varied with variety and was greater in stem-rust susceptible varieties than in resistant ones. Recovery was quicker and percentage recovery greater in the resistant varieties.

4315 **Scientific Report of the Indian Agricultural Research Institute for the year ending 30th June, 1958** : Pp. 212.

Wheat. Progress continued in breeding rust-resistant bread wheats for the plains at Delhi and Pusa and for the northern hills at Simla and Bhowali. At Delhi, many advanced selections from crosses of commercial Indian varieties with resistant introductions were highly resistant to one, two or all three of the rusts *Puccinia graminis* var. *tritici*, *P. triticina* and *P. glumarum* under artificial conditions of infection and also had good agronomic characters. A particularly encouraging performance was given by derivatives of crosses involving Rio Negro, Fronteira, Cometa Klein, NP790 and Kenya 184 P2AIF. on the one hand and NP710, NP718, C281, C591, C518 and NP781 on the other. Progress was also made in incorporating loose-smut resistance into NP775 and awns into the awnless, rust-resistant varieties NP797, NP798 and NP799. Introduced varieties of *Triticum durum* and an indigenous *T. dicoccum* wheat (IC1057) have been successfully used as sources of resistance in crosses with *T. aestivum*. Further work was carried out on improving *T. durum* at Indore and *T. dicoccum* at Wellington. The *T. dicoccum* selection PD13, now designated NP200, possessing a high degree of field resistance to stem rust, was released for the Nilgiri and Palni hills in Madras State [cf. 1412].

Tests of the chapati-making quality of hill wheats showed NP792 and NP770 to be especially suitable. Regional yield trials of the NP700 and NP800 series indicated the superiority of several varieties in these series over local wheats.

Trials were carried out in the project on developing varieties responding to different levels of soil fertility.

In studying the genetics of rust resistance, progenies of 32 crosses were tested as seedlings for reaction to several races of stem rust. Resistance to race 15 appeared to be controlled by a single dominant gene, except in NP718 x NP790, where two duplicate genes were involved. In one cross, an inhibitory gene was apparently involved in the expression of susceptibility to this race. Susceptibility to race 15C was dominant, depending on one or two genes. Reaction to race 75 was conditioned by two duplicate factors in some crosses, but was monogenic in others. Resistance to race 42B was controlled by a single dominant gene, and resistance to race 21 by one gene or two duplicate genes. The field resistance of Kenya 184 P2AIF. to stem rust was governed by duplicate genes. Three factors determined the field resistance of Fronteira and La Previsión to leaf rust. Further data on the latter variety also suggested a three-factor control of its field resistance to yellow rust. Such characters as shattering, glume colour and glume pubescence were each monogenic. Grain colour in La Previsión apparently depended on duplicate genes and in NP785 on one gene.

Of the radiation-induced mutants, early-ripening, stiff-strawed or fully-bearded mutants of NP797, NP798, NP799 and NP809 and stiff-strawed or stem-rust resistant mutants of C591 are of economic interest. Observations on a cross between the fully-bearded mutant of NP809 and the usual form of this variety (awns 1–2 cm. in length, $B_1B_1\ b_2b_2\ hdhd$) indicated that the mutant had arisen through a cryptic deletion or intragenic alteration at B_1, a 3 : 1 ratio of tipped : fully bearded segregates being obtained. Monosomic analysis revealed that chromosome IX of Cometa Klein carried the gene for seedling resistance to race 13 of yellow rust and IV and VI the genes for seedling resistance to race H [cf. 1704].

Maize. In trials of top, single and double hybrids, introduced varieties and intervarietal crosses, the locally-produced double cross (T61 x Hy) x [My B–I x P4A(y)–13y] gave the best yield, surpassing the control, the local open-pollinated variety KT1, by 120%.

Barley. At Wellington, crosses of Local with B122 and B150 yielded lines combining resistance to yellow rust and loose and covered smuts with all the desirable characters of Local.

Pennisetum typhoides. In a trial of 80 top-crosses of S_2 lines, two (IC1724/2–1 x T55 and IC1724/1–3 x T55) produced considerably higher yields of grain than the control, T55. Preliminary data on a pistilless variant indicated that it was a triple recessive.

Sorghum. Of the F_1 hybrids between ♂ sterile Texas Blackhull Kafir and indigenous types, the combination involving IC3437 showed most hybrid vigour, giving a 36·94% higher yield of grain than the better parent, IC3437. A cytoplasmic type of ♂ sterility was discovered in the indigenous variety IC2360. Promising selections for forage were secured from F_3 T263 x Sweet Sudan grass and (T263 x Sweet Sudan grass) F_1 x T263. Early-maturing and white, chalky-seeded dual-purpose types were selected from F_3 EC4315 x Early Prodigy.

Trifolium. Tetraploids of *T. alexandrinum* maintained their superiority in growth. Further selections were made, based on forage yield, dry-matter content and seed fertility. Although dry-matter content was generally lower in the $4x$ form than in the $2x$, several $4x$ cultures equalled or surpassed the corresponding diploids. Dry-matter content was negatively associated with yield of green fodder, and increased after the second cut in both $2x$ and $4x$ forms. A polycross nursery of $4x$ genotypes was established. Average number of quadrivalents in $4x$ plants was 2–3. Three $2x$ cultivars were X-irradiated and then treated with colchicine, in an attempt to induce segmental interchanges and thus obtain $4x$ plants with some resemblances to segmental allotetraploids in cytological behaviour.

Cotton. Selections of *Gossypium hirsutum* continued to show improvements in yield and ginning outturn over H14.

Essential-oil plants. Selections of severa species such as *Carum copticum, Coriandrum sativum, Cuminum cyminum, Foeniculum vulgare* and *Anethum graveolens*, are under study.

Chilli. F_1 NP46A x Puri Red showed resistance to mosaic in preliminary tests. The mosaic resistance of Puri Red thus appears to be dominant.

Oilseeds. Five new strains of linseed resistant to *Melampsora lini* yielded well. Crosses and back crosses have been effected for studying the inheritance of quantitative characters. Further progress was made in selecting tetraploids for seed fertility.

Tetraploids of *toria* gave a good performance at Delhi and elsewhere. The $4x$ form is particularly well suited for Bihar State, where it may possibly replace the less hardy yellow sarson.

Grapefruit. A bud mutant of Foster, with nearly seedless fruits which compare favourably in quality with those of Marsh Seedless, was discovered.

Pomegranate. Cytological study of the nature of the sterility in various varieties was initiated. A chromosome number of $2n = 18$ was found in Double Flower, in contrast to $2n = 16$ in other varieties, such as Dholka, Muscat White, Kandhari and Patiala.

Grape. Induction of polyploidy by colchicine continued.

Root vegetables. In carrot and turnip, selections were made in the F_2 and back crosses of hybrids between temperate and local varieties, with a view to developing varieties with good seed production in the plains.

Tomato. The F_1s of Sioux x Prosperity and Pusa Ruby x Prosperity were notable for their high yields. Male sterility is being introduced into varieties with the best combining ability, to facilitate commercial production of hybrid seed. The closed-anther type of sterility has been found in the indigenous variety Improved Meeruti. An induced mutant of Meeruti has a completely red skin; the green colour ordinarily persisting at the stem-end of the fruits is an undesirable feature of this otherwise popular variety.

Egg plant. Now that a closed-anther mutant is available from Canada, investigations on hybrid vigour have been resumed. Transference of this character to desirable varieties is under way.

Okra. Intervarietal crosses have yielded selections which have remained completely free from yellow-vein mosaic.

Pea. Hybrid selections showing marked improvement over the standard variety, Early Badger, in pod length, colour and number were made. Selections resembling Greenfeast, but early in pod formation, were also obtained.

Pigeon pea. Selections highly resistant to *Fusarium udum* have been developed.

4316 **Administration Report of the Agricultural Department, Kerala, for the year 1958–59** (1960) : Pp. 109.

Rice. Variety testing, pure-line selection and hybridization continued at the various stations, in furtherance of objectives already described [cf. 1413].

Coconut. At Nileshwar, F_1s of (1) Tall x Gangabondam (prolific semitall type), (2) Andaman Ordinary x Settlements, (3) Tall x Dwarf and the reciprocal and (4) crosses between F_1s of Tall x Dwarf are being studied with regard to hybrid vigour. Crosses between Spicata and Tall have been made in both directions to determine whether the abundant production of flowers of the former type can be combined with the high yielding capacity of the latter. Observations continued on progenies of high-yielding parents within the Tall type, involving the characters high number of nuts, abundant production of female flowers, high setting percentage, thick flesh and large dehusked nuts. Selfing and hybridization between selfs are receiving attention. Crosses of Tall x (Tall x Dwarf) and the reciprocal were effected to elucidate the role played by Dwarf in making Tall x Dwarf hybrids superior to Tall. Open-pollinated F_2s of Tall x Dwarf are under observation as material for selection.

Proceedings of the Sixth Scientific Workers' Conference held in the Agricultural College and Research Institute, Coimbatore on 7th August, 1956 (1960) : Pp. 100.

4317 *Krishnaswamy, N., Raman, V. S. & Chandrasekaran, P. Some problems arising out of interspecific hybridization in sorghum.* (*pp. 1–8*).

Chiefly with reference to panicle types in the F_2, observations are reported on crosses of (1) *S. sudanense* with *S. durra* var. *mediocre*, *S. roxburghii* var. *hians* and *S. verticilliflorum*, (2) *S. halepense* ($2n = 20$) x *S. roxburghii* var. *hians* and (3) *S. halepense* ($2n = 40$) x *S. durra* var. *coimbatoricum*. The data are discussed with respect to their significance in elucidating the evolution of the grain sorghums and for breeding.

4318 *Kandaswamy, M. & Sundaram, N. V. Studies on rust resistant tenai varieties in Madras State.* (*pp. 79–80*).

Three of the nine Japanese varieties of *Setaria italica* tested at Coimbatore were significantly superior to the control (SI3560) in yield, besides being highly resistant to *Uromyces setariae-italicae*.

4319 *Narasinga Rao, U. Preliminary studies in the classification of bhendi.* (*pp. 81–87*).

Preliminary study of 26 types of okra at Coimbatore has pointed to the value of stem colour and stem spininess as primary characters in classification. Leaf shape and fruit colour are considered to be useful secondary characters. Petiole pigmentation and pubescence, colour of the veins and midrib of the leaf and fruit texture may also be of service as subsidiary characters in establishing subgroups among types but require further investigation in this connexion.

4320 **Annual Administration Report of the Department of Agriculture in Mysore State, for the year 1956–57** (1960) : **1** : Pp. xvii + 568.

Information is provided on variety testing and selection of rice, sorghum, *Eleusine coracana*, *Setaria italica* and other millets, grasses, legumes, sweet potato, chilli, pulses and various other crops. Work on cotton promoted by the Indian Central Cotton Committee is also reported [cf. XXIX, 4112].

4321 **Annual Report of the East African Agricultural and Fisheries Research Council, 1960** (1961) : Pp. 57.

Maize. Studies on the genetics of resistance to the streak-disease virus are reported [cf. 1426].

Sorghum. Among the problems being studied at Serere, Uganda, are the inheritance of testa type and the fertility of autotetraploids.

French bean. Unspecified varieties resistant to the two local races of *Uromyces phaseoli* have been found.

4322 **Annual Report of the Department of Agriculture, Colony and Protectorate of Kenya for 1959. Volume II—Record of investigations.** 1961 : Pp. 174.

Wheat. In a large-scale back-crossing programme involving 188 lines resistant to *Puccinia graminis* var. *tritici* and 5 good quality local varieties, the Canadian variety Regent has proved particularly valuable. Twenty-four new crosses were made between selected stem-rust resistant parents. Some promising material was obtained from the cross (Lee Frontana x Kenya 294M^3) x (CI12632 x Kenya 294M^3), which combines resistance to stem rust and *P. glumarum*.

Maize. Breeding for resistance to *Puccinia polysora* continued. A new synthetic named Early Synthetic has been developed from local white maize.

Forage crops. Good progress was made in the selection of leafier and more vigorous types from *Chloris gayana* and *Setaria* sp. Some outstanding plants have been selected from a collection of *Trifolium burchellianum* var. *johnstonii*.

Coffee. Of a number of varieties examined for resistance to *Hemileia vastatrix* races I and II, only the Indian varieties S288, S333 and S795 proved resistant to both.

Pyrethrum. Some promising lines were obtained from a polycross involving Polhill and a large number of selected clones with upright growth habit.

Recherches agronomiques. Sommaire des résultats 1958–1960. Le Conseil des Recherches Agricoles. **(Agronomic research. Summary of results, 1958–1960. Agricultural Research Council).**
Québec 1960 : No. 5 : Pp. 29.

4323 *Baribeau, B. Production et transformation des pommes de terre pour l'industrie des "chips". (Production and transformation of potatoes for the crisp industry). (pp. 4–6).*

Twenty-seven varieties are classified according to their suitability for processing as potato crisps; some promising new varieties are also listed.

4324 *Steppler, H. A. Red clover breeding. (p. 27).*

A selfing and sib-crossing programme, using plants referred to as type 0 and type 4, is being undertaken at McGill University.

Proceedings of the Caribbean Region. American Society for Horticultural Science. VIII. Annual Meeting, Puerto Rico, May 29–June 4, 1960 : Pp. xiv + 107.

4325 *Soderholm, P. K. & Gaskins, M. H. Evaluation of cold resistance in the genus* Coffea. *(pp. 8–15).*

Based on evidence from field and laboratory studies, 189 varieties and selections representing 13 species were classified into 4 groups based on cold resistance. Group 1 (no injury) comprised 30 *C. arabica* varieties, 2 *C. racemosa* varieties and 1 unidentified species. The material examined formed part of the germplasm collection at the US Plant Introduction Station, Miami, Fla.

4326 *Kohashi S., J. Mejoramiento genético de la calabaza* (Cucurbita *spp.*) *en México.* [*Genetic improvement of squash* (Cucurbita *spp.*) *in Mexico*]. (*pp. 16–19*).

Observations on a collection of local squash varieties indicated that four species are represented: *C. pepo*, *C. moschata*, *C. maxima* and *C. mixta*. Variability was great in all the species and some hybridization is thought to have occurred. *C. moschata* 'XII–135A' and *C. pepo* 'XII–11' are two promising varieties which have been obtained by inbreeding.

4327 *Stambaugh, S. U. Multiple top papaya plants.* (*pp. 48–50*).

Varietal differences are recorded in response to the practice of disbudding plants to encourage suckering.

4328 *Corns, J. B. Breeding and development of a lettuce variety for south Texas.* (*pp. 58–60*).

Bred especially for the Lower Rio Grande Valley, Valverde is immune to local races of *Bremia lactucae.* The variety is of complex parentage but derives from an original cross between *Lactuca serriola* and *L. sativa* 'Imperial D'; its downy-mildew resistance was inherited from the wild parent. The plants are dark green with firm, well folded heads. This variety was developed at the Texas Agricultural Experiment Station, where attempts are now being made to eliminate (1) a tendency to produce side shoots and (2) the formation of excessively long stems and the premature production of seed stalks when planted before mid-October.

4329 *Gregory, L. E., Almeyda, N. & Theis, T. The black pepper research program in Puerto Rico.* (*pp. 64–65*).

A brief account is given of some of the problems being studied at the Federal Experiment Station, Mayagüez.

4330 *Azzam, H. Natural cross-pollination of tomatoes in Puerto Rico.* (*pp. 85–86*).

Based on the occurrence of the cut-leaf character in selfed progenies of the potato-leaf variety Red Jacket, natural cross pollination percentages of 0–24% were recorded, the average being 8·3%.

Carnegie Institution of Washington. Year Book No. 59 : 1959–60 : Pp. lvii + 515.

4331 *Clausen, J., Nobs, M. A. & Hiesey, W. M. Interlatitudinal selection experiments in* Poa. (*pp. 322–24*).

Preparation of the data on hybrids between apomictic *Poa* parents for publication as a complete report continued [cf. 3075]. The statistical processing of data on the responses of parental and hybrid apomictic lines in plantings in the USA and abroad is about two-thirds completed. The work has included investigations on successive generations combined with tests at different latitudes. In the spring of 1960, a few new plantings were made at Stanford (38° N.) in California, using seed from Volbu (61° N.) in Norway. The ancestors of these types were originally sent from Stanford to Volbu in 1949. The new plantings comprised: six apomictic lines selected in Norway from descendants of *P. ampla* 'Kahlotus' x *P. pratensis* 'Athabaska'; a line from *P. ampla* x *P. pratensis* var. *alpigena*; and two natural apomictic lines of *P. pratensis.* The first group of lines were grown for two generations and the remaining strains for four generations in Norway. Comparisions will be made with the original material to determine whether any changes in biotype are expressed.

4332 *Hershey, A. D.* et al. *Growth and inheritance in bacteriophage.* (*pp. 421–24*).

Chromatographic analysis of DNA extracted from phage particles by phenol indicated that the DNA can be extracted without breakage of the molecules. From other physical measurements it was estimated that a particle of phage T2 contains two molecules of identical molecular weight (50 million), one or both of which must constitute the phage chromosome.

Evidence has been obtained that the internal protein fraction later to be incorporated into phage T2 particles is synthesized without delay after infection. Synthesis of this fraction is therefore initiated by parental phage DNA and is independent of the synthesis of other phage proteins, whose production is initiated considerably later, after the commencement of new DNA synthesis.

The target in infected bacteria which is sensitive to ultraviolet light and responsible for phage production and genetic recombination between phages proved to be associated with DNA synthesis and not with protein synthesis. This finding is incompatible with the hypothesis that genetic reproduction involves transfer of information from DNA to protein and the reverse transfer. It suggests instead that transfer of information is directly from DNA to DNA.

4333 *Streisinger, G., Mukai, F. & Miller, B. Genetic studies with bacteriophage.* (*pp. 424–26*).

Methods for selecting mutants of phage T4 producing a changed lysozyme have been developed [cf. 3077]. Analysis of the fine structure of the gene responsible and of the role of the lysozyme in the life cycle of the phage has been initiated. The lysozyme molecule is small, containing about 150 aminoacids, and should therefore be readily analysable.

This system is expected to be useful in investigating the molecular relations between a gene and its protein product.

4334 *Demerec, M.* et al. *Bacterial genetics.* (*pp. 426–41*).

Mutations in region *cysC* of *Salmonella typhimurium* afford especially suitable material for comparative investigations of single-site mutations and deletions, because this region has a much higher frequency (about 40%) of spontaneous deletions than the other known regions of the chromosome, which have a frequency of about 4%. Two basically different processes have been found responsible for deletion mutants and single-site mutants. Both processes are affected by ultraviolet radiation and by the factors causing spontaneous mutation, but mutator genes and the mutagen 2-aminopurine affect only the process responsible for single-site mutants. Of the 29 deletions analysed, 25 were long and extended over closely similar sites in locus *cysC*. From the analysis it is inferred that (1) the sections of the locus containing the two ends of the deletions were homologous (duplicated), (2) during chromosomal reproduction the duplicated portions occasionally synapsed, causing the formation of a loop of predetermined size, and (3) in replication the looped segment was left out, deletions of about the same length thus being produced. Study of 39 arginine-requiring mutants of *Salmonella* revealed that seven loci are involved in control of arginine biosynthesis. The genetics of bacterial resistance to high concentrations of streptomycin was investigated. Transference of the factor *Hfr* for high frequency of recombination from *Escherichia coli* to *S. typhimurium* has been accomplished. A hybrid strain carrying *Hfr* is being used extensively in the construction of a genetic map of the *Salmonella* chromosome. Twenty-two mutations at loci *tryC* and *tryD* in *Salmonella* have been mapped and analysed with respect to their patterns of spontaneous mutability and mutability induced by chemical mutagens and ultraviolet radiation, their complementation relationships, suppressors affecting them and the exceptional behaviour of some alleles in recombination. [Cf. 3078].

4335 *Kaufmann, B. P., Gay, H., Dutt, M. K., Bal, A. K. & Buchanan, J. The nature of the materials of heredity.* (*pp. 441–53*).

Further studies on *Drosophila* confirmed that deoxyribonuclease has mutagenic properties. Other investigations included electron-microscopic examination of meiotic prophases and postmeiotic mitoses in microsporogenesis in *Tradescantia* [cf. 3079]. Pairing cores and the fine fibrillar organization of the chromosomal and attachment-plate materials during early meiotic prophases have been demonstrated. The vegetative nucleus in the pollen grain displayed structural features suggestive of ameboid activity. It is assumed that this nucleus gives rise to cytoplasmic organelles by a process analogous to the blebbing observed in *Drosophila* by Gay [XXX, 2254].

4336 *McClintock, B. Chromosome constitutions of Mexican and Guatemalan races of maize.* (*pp. 461–72*).

A study was made of the chromosome constitution of 25 races from Mexico, 17 from Guatemala, 6 from Cuba and 1 each from Honduras, Nicaragua, Costa Rica, Haiti, Martinique and Trinidad. All races were grown at the Agricultural Experiment Station at Chapingo, Mex., operated by the Rockefeller Foundation. Only one inversion, composed of the distal two-thirds of the short arm of chromosome 8, is known to have persisted in maize, which shows a marked degree of conservatism in the linear organization of the chromosomes. Heterozygotes for this inversion were found in four races, all from central Mexico. The inversion had previously been observed in one particular Bolivian race. It may be suspected that this race possesses a chromosome 8 from an introduction from central Mexico. One other type of chromosomal modification, "abnormal chromosome 10", was widely distributed. This chromosome, readily identifiable by an extensively modified segment at the distal end of its long arm, is very widely distributed in North America but has only a limited distribution in western South America. It may therefore have been introduced into South America in recent times. Chromosome components exhibiting pronounced heritable differences within or between races are the knobs, the nucleolus organizer and some chromomeres whose positions are specific. Emphasis was laid on the knobs and on one particular chromomere in the present study. On the basis of the types of knobs discovered and their individual distributions in races in North and South America, it is suggested that cultivated maize may have had several independent origins, from plants whose knob-forming regions had distinctly different capacities for producing knob substance. Much of the maize now cultivated in western Mexico, the west coastal regions of Central America and northern Venezuela may thus have been derived from original types in which most of the knob-forming regions had well-developed capacities for producing knob substance, whereas maize being grown in west central Guatemala originated from a type whose knob-forming regions were very limited in this capacity. With a view to testing the various theories on the origin of maize, the types of knob complexes in different strains of *Euchlaena* and *Tripsacum* should be examined. On the combined basis of information gained from preliminary [cf. 3080] and recent studies, races from western South America are discussed to illustrate how knob constitutions may reveal the contribution of foreign maize to the origin of races in a given territory and can in some cases make it possible to infer the source of the introduced maize. Examining plants from several localities in a country in the case of each race is considered to be more informative than sampling a particular race by specimens from only a single locality. By the wider method of sampling it was found that some segments pass through racial boundaries and filter along certain paths. Such knowledge is important for an appreciation of the contribution of particular segments to the characters shown by races within a region. The method also revealed the extensive migration of the B-type chromosome, passing through racial delimitations. This chromosome is widely distributed in Indian maize in the central and southwestern parts of the USA and also in Mexican maize. It was also found to be highly frequent in some areas of the Andes and in some lowland regions in Chile. Since the B-type chromosome does not alter the genetic expression of racial characters, it is easy to understand how it may infiltrate all races within a territory in the absence of selection against it. The evidence so far obtained from chromosome constitutions concerning the origin of races in Mexico and Guatemala is described. An extensive mixing of different germ plasms in many regions is indicated.

4337 **A decade of progress in serving Georgia through research.**
Ann. Rep. Ga. agric. Exp. Stas. 1960 : Pp. 158.

This review of ten years' progress in agricultural research at the above experiment stations includes sections on field crops, forestry, fruits and vegetables, and pasture and forage crops. Brief notes are given on varieties released during this period and also on promising strains now being developed. A list of current projects is given.

4338 **Annual Report of the University of Florida Agricultural Experiment Stations for the fiscal year ending June 30, 1960** : Pp. 364.

Oats. Experiments with a range of *Avena sativa* genotypes indicated that grain production is more sensitive to environmental changes than forage production. Forage production had a relatively low heritability value (24%). The results of a series of experiments with oat seeds show that sensitivity to γ radiation decreases as moisture content rises from 3·2 to 9·6%. It reaches a minimum at 10–12% but increases at moisture contents above 12%. Radiation damage was increased by storing seeds after treatment; seeds with low moisture content showed the greatest storage effects. When seeds with low moisture content were hydrated immediately after treatment, they exhibited no more damage than seeds with 10% moisture. Studies on induced mutation rates at the locus controlling susceptibility to *Helminthosporium* (*Cochliobolus*) *victoriae* in Victorgrain showed that these are of the same order of magnitude as those reported for mice and *Drosophila*. The addition of Southland to the set of oat smut differential varieties made possible the separation of two distinct Fulghum races of the pathogen. The two Fulghum races and one Victorgrain race are said to differ from previously described races. In addition, 20 cultures from four south-eastern states were separated into six pathogenic groups. A mutant crown-rust resistance gene of the Victoria type was simply inherited and partially dominant. Studies on host reaction to *H. victoriae* revealed at least three degrees of susceptibility. Atlantic was most tolerant, while selections 215 and 227 were most susceptible; Victorgrain exhibited an intermediate reaction "and appeared to carry two levels of susceptibility well balanced within the population". Variation in host reaction is thought to be due to "background effect". Victoria-blight resistant varieties and resistant mutants selected from a susceptible variety contained significantly more arginine than susceptible varieties. A high-yielding bulk selection derived from irradiated Floriland has shown resistance to Victoria blight and to crown rust races 203 and 216; it has also shown mature-plant resistance to the virulent Landhafer-attacking races, 264 and 290. The selection has been named Florad and is being distributed.

Maize. An experimental hybrid, selected for ability to combine with F44 x F6, gave significantly higher yields than Dixie 18 and Florida 200. Several other promising hybrids were obtained. In trials of *Heliothis*-resistant varieties, Iona, Golden Security and an unnamed variety gave the highest yields of worm-free ears; Seneca Warpath was also highly resistant. As measured by the effect on seedling height, susceptibility to radiation damage was greater in Min.A158 than in Min.A158T, which differs from the former only in being cytoplasmically ♂-sterile.

Forage grasses. *Bothriochloa intermedia* 'A5410' from India shows good yield potential as a pasture or hay crop. *Pennisetum ciliare* 'Chipinga' and 'Grassland' from South Africa have also yielded well. A number of *P. spicatum* and *P. glaucum* introductions are being used in breeding. Improvement of pearl millet by inbreeding and by crossing with *P. spicatum* continued. No ♂-sterile plants were found in 30 progenies resulting from different crosses of normal with ♂ sterile lines; the progenies included some promising breeding material however. Crossing of *P. purpureum* and *P. ciliare* with *P. glaucum* continued. Most of the *P. purpureum* hybrids were killed during the winter, but among the survivors were some plants which have leaves with fewer spines and reduced pubescence and which appear to be less fibrous. Two hundred and eight *Digitaria* accessions are being evaluated for growth type, winter hardiness and seed production. Ten of these, which appeared to grow as fast as or faster than *D. decumbens*, are under observation; all are stoloniferous types. PI224252 and PI225594 were the best of five *Cynodon dactylon* introductions tested. A selection of *Stenotaphrum secundatum* which was resistant to *Piricularia grisea* had a higher content of proline than a susceptible selection.

Lucerne. An experimental strain, developed through three generations of mass selection for perennial habit, has shown significantly better persistence than Hairy Peruvian.

Clover. Breeding for improved persistence, productivity and disease resistance in red and white clovers continued. A synthetic white clover produced by intercrossing 26 clones selected for summer persistence [cf. 1538] has given good forage yields; tests of summer persistence are not yet complete. Significant differences in forage yields were noted between different polycross progenies from these 26 clones, indicating that a high-yielding synthetic might be obtained by further selection. Selection for winter and early spring forage production was initiated in a mildew-resistant strain of red clover.

Lupin. Attempts are being made to transfer the bean yellow mosaic virus resistance of G619 [cf. XXX, 2360] to commercial yellow lupins. G619 was also crossed with *Lupinus rothmaleri*, a species that crosses readily with the yellow lupin. A bitter, blue lupin selection with resistance to *Stemphylium solani* produced higher green matter yields than the common, bitter blue lupin. Of 75 lines of *L. luteus* which were screened for resistance to *Phomopsis leptostromiformis*, 11 were resistant and 30 gave an intermediate reaction; some lines included both susceptible and highly resistant individuals.

Crotalaria. Cytoplasmic ♂ sterility is being transferred from a ♂ sterile strain of *C. mucronata* to other lines and varieties of this species. Investigations into the restoration of fertility are in progress. F_1 seed was obtained from *C. maritima* x *C. rotundifolia*.

Kenaf. Root knot nematode-resistant progenies from (*Hibiscus cannabinus* x *H. eetveldeanus*) x *H. cannabinus* were again back crossed to *H. cannabinus*. Early and late-maturing types were selected from the F_3 of a series of diallel crosses.

Tobacco. Selection of flue-cured lines for yield, leaf quality and root knot nematode resistance continued. Attempts are being made to transfer nematode resistance from flue-cured to cigar-wrapper tobaccos.

Capsicum. A single mutant plant, resistant to potato virus Y and designated YRP10, was selected from a Y-susceptible variety. The mutant was homozygous for a recessive gene which could not be distinguished from the gene conditioning resistance in P11. Progenies derived from the mutant were susceptible to tobacco etch virus; reactions to the two viruses are therefore not related pleiotropically. Observations were made on the reaction to inoculation with potato virus Y of progenies from crosses between susceptible Large Bell Hot and the resistant lines P11 and P34. Mild symptoms were exhibited at the frequency expected for a single gene pair in the heterozygous condition, while severe symptoms appeared to result when the dominant allele was homozygous. A mutant phenotype was discovered in which several abnormalities, including ♀ sterility, were inherited as a single unit and at a frequency which suggests that the plant is homozygous for a single recessive gene. Anther colour was inherited independently of the mutant characters. Tests on over 600 varieties revealed no source of resistance to cucumber mosaic virus.

Castor oil plant. Wild strains with resistance to *Sclerotinia ricini* are being used in breeding.

Peach. Further crosses were made using seedlings with low chilling requirement. Two new varieties were released. Flordawon is an early, yellow-fleshed freestone variety which requires about 250 hr. chilling. Flordaqueen is said to require about 550 hr. chilling and to ripen its fruits 10 days after Maygold.

Citrus fruits. Screening for resistance to *Radopholus similis* continued; the sweet oranges Sanguine grosse ronde [Large Round Blood] and Pineapple RS–15b were highly tolerant and resistant, respectively, while the Carizzo citrange was fairly tolerant. Hand pollination studies showed Orlando and Minneola tangelos to be self sterile and also cross sterile with one another; Temple was the best pollinator for these varieties. Hand pollination of Dream navels with various pollens only slightly increased fruit setting. Selection of nucellar seedlings continued. *Citrus grandis* and *Poncirus trifoliata* were used as pollen parents in this year's crosses. Eleven nucellar seedlings were selected from Minneola tangelo x *P. trifoliata* and one from Marsh Seedless x *P. trifoliata*.

Groundnut. The highest yielding lines in station trials were Fla.393, Fla.329, Early Runner and Fla.404; the numbered lines are of hybrid origin with Florispan Runner as one parent. A new large-seeded selection from Fla.392–12 shows promise. A number of crosses involving Early Runner, Dixie Runner and the Fla. lines 392–12–5, 404 and 420 were made. Four separate lines of Dixie Runner were intercrossed in an attempt to improve the yield of this variety.

Rubus. Three colchicine-induced tetraploid ($4x = 28$) trailing blackberries were crossed reciprocally with 28-chromosome types with semierect to erect habit; seed was easily obtained. When Austin Thornless blackberry was crossed with Boysen and Halsham, some of the resulting seedlings were not only thornless but extremely vigorous. A series of severe frosts made possible the selection of a number of seedlings for frost resistance. Seed of the 14-chromosome progenies from *R. albescens* black raspberry x Latham red raspberry gave only triploid plants when treated with colchicine.

Blueberry. Of 1200 seedlings of *Vaccinium darrowi* x northern high-bush parentage, 25 were selected for further evaluation; their fruits ripened a month earlier than the earliest rabbit-eye types and were of comparable quality.

Grape. Selection 1147 [cf. XXIX, 241] has been released under the name Blue Lake.

Pinus. To provide information on the inheritance of tree form and other vegetative characters, crosses were made between *P. elliottii* and *P. clausa*, and between local slash pines and var. *densa* from southern Florida. Selected slash pines were cross pollinated for studies on the inheritance of various crown and bole characters. Young cones of grafted scions from superior trees of *P. taeda* and slash pine were pollinated to obtain seed for progeny tests.

Celery. Breeding for resistance to *Cercospora apii* continued.

Cantaloupe. A new variety, Seminole, was released. It is highly resistant to downy and powdery mildews and gives above-average yields of melons of uniform size and netting; eating quality is good.

Water melon. The combining ability of different $4x$ x $2x$ combinations for the production of seedless $3x$ melons is being studied. F_2 material was obtained from Northern Sweet x Congo, a cross made in a programme to introduce hermaphroditism into a commercial melon type. Seed was harvested from 53 selfed or open-pollinated X_1 progenies from a cross in which Congo was pollinated with γ-irradiated pollen of Northern Sweet. Lines exhibiting cytoplasmic ♂ sterility are being sought in *Citrullus vulgaris* and related species.

Tomato. From 30 breeding lines, 14 single-plant selections were made for multiple disease resistance. The inheritance of resistance to cracking is being studied. Ten dwarf selections were made from the F_2 of crosses between the dwarf variety Miniature and several standard varieties. Studies on γ-irradiated pollen showed a stimulation of pollen tube growth at low doses; fruit set was adversely affected as the dose increased. Sensitivity to γ rays, as indicated by pollen abortion, was greatest in premeiotic buds.

Bean. The F_2 material from 45 crosses of Blue Lake climbing bean with various bush-type breeding lines is being selected for promising climbing types. Selection of round-podded stringless climbing beans resistant to rust and to common, southern and yellow bean mosaic viruses continued.

Lima bean. A fertile F_2 plant was obtained from the almost completely sterile F_1 of a cross between *Phaseolus lunatus* and *Ph. polystachyus*. A male sterile plant obtained by back crossing F_1 plants to *Ph. lunatus* was female fertile with the latter species and has given 42 seeds. Material was also obtained from crosses of *Ph. vulgaris* with *Ph. coccineus*, *Ph. dumosus* and *Ph. polyanthus*.

Soya bean. Preliminary selections were made from crosses effected between experimental lines selected for local adaptation.

Sweet corn. Screening for resistance to *Trichometasphaeria turcica* continued.

4339 Lyle, C. & Leveck, H. H.
73rd Annual Report of the Mississippi Agricultural Experiment Station for the fiscal year ending June 30, 1960 : Pp. 99.

Wheat. Attempts to introduce shorter straw and resistance to leaf rust, stem rust and powdery mildew into Chancellor, Taylor and Coastal continued.

Oats. State College 16, a new winter-hardy variety resistant to *Helminthosporium victoriae* is undergoing final testing. Five lines resistant to the Landhafer crown-rust races 264 and 290 have been selected.

Maize. Genes for dwarfing are being introduced into a number of southern lines, with a view to increasing resistance to lodging. In tests at the Delta Branch Station, dwarf hybrids yielded 24% less than standard hybrids and were inferior in grain quality.

Barley. The development of barley varieties resistant to mildew, rust, scald, smut, net blotch and aphids continued.

Sorghum. A number of brown-seeded, hybrid grain selections showed resistance to grain deterioration during wet weather.

Rice. A plant obtained by back crossing (*Oryza sativa* x *O. glaberrima*) with *O. sativa* is being studied for possible use in the breeding programme.

Grasses. Three synthetic polycross *Lolium perenne* lines gave higher yields of forage and seed than the local variety. The development of ryegrass varieties resistant to crown rust continued [cf. 1568]. An intensive programme for Dallis-grass improvement is described briefly.

Sweet potato. M–97–4 is reported to be highly resistant to wilt, *Fusarium oxysporum* f. *batatas* and to show some resistance to the root symptoms caused by the internal cork virus disorder.

Cotton. Tetrazolium chloride and tetrazolium red were found to be suitable stains for the study of pollen viability. Five new doubled haploids, derived from Seaberry, Seabrook and TzRv, are being studied. M8948, a doubled haploid of Deltapine, gave high-quality progeny when crossed with Coastland 401. The genetic control of glandlessness in seeds is being studied, with a view to transferring this property to M8948 and M11. A new Upland strain lacking nectaries was recently produced; the two recessive genes for this character were derived from *Gossypium tomentosum*. Three new smooth-leaved lines, obtained at the Delta Branch Station, compared well with the best commercial varieties in earliness, yield and fibre quality. At the same station, a number of lines showed considerable resistance to the nematode - *Fusarium* wilt complex.

Pepper. High-yielding lines resistant to the tobacco-etch and tobacco-mosaic viruses were selected at the Truck Crops Branch Station. Breeding for resistance to *Cercospora* blight and the root-knot nematode was carried out.

Sesame. Some progress is reported in the development of disease-resistant, easily harvested varieties.

Cauliflower. Several crosses were made with a view to combining the early heading characteristics of Station cauliflower with the cold hardiness and vigour of Round Dutch cabbage.

Melon. Mississippi 1717 is undergoing final tests prior to possible release.

Tomato. Two strains of Kopiah have remained free from symptoms of internal browning for three years. The development of varieties resistant to nematodes and *Fusarium* wilt continued.

Bean. Several snap-bean selections have shown good resistance to common bean mosaic.

Cowpea. Mississippi 57–1 has shown complete resistance to *Fusarium* wilt and root-knot nematode as well as tolerance of virus diseases. It appears that either a single gene, or a group of closely linked genes, is responsible for resistance to *Meloidogyne incognita* and three other nematode species.

Soya bean. Of the varieties Dorman, Jackson, Lee, Hood and Hill, the last three are resistant to *Xanthomonas phaseoli* var. *sojensis*, the last four are resistant to *Corynespora cassiicola*, while all five have field tolerance of *Phytophthora* rot.

Sweet corn. Resistance to earworm (*Heliothis* sp.) was successfully transferred from inbred lines to hybrids. In a 42-entry trial, the best combination of yield, quality and earworm resistance was shown by Golden Security, Tempo, Sweet-and-Gold and Royal Gold.

4340 **What's new in farm science. Annual report. Part II.**
Bull. Wis. agric. Exp. Sta. 1960 : No. 547 : Pp. 80.

Disease resistance. Investigations on the identification of substances conferring resistance to insects and diseases in crops are in progress with a view to facilitating breeding. Factor A for resistance to *Pyrausta nubilalis* in maize has been identified as 6-methoxybenzoxazolinone [cf. XXIX, 1521]. This compound has also been isolated from wheat and rye and from roots of *Coix*. In lucerne, "salicylic acid, a form of phthalic acid, and flavinone" may offer protection. Cabbage has been found to contain indole-3-acetonitrite and potato foliage salicylic acid and a flavone.

Oats. The new midseason variety Portage, involving Ajax, Hawkeye and Victoria in its pedigree, is expected to do well on soils of medium or lower fertility throughout Wisconsin. It has almost white hulls, better grain quality than Branch or Ajax, and resistance to stem-rust races 7 and 7a and to most races of leaf rust.

Maize. Hybrids W269, W346, W352, W646, and W647 are to be released. They all have strong stalks, yield well in their respective maturity classes and give high-quality grain.

Barley x rye. Double fertilization has been found to occur in each direction of this cross. The embryo dies 6–10 days after pollination because of failure of the endosperm to develop.

Forage crops. Cooperative projects initiated between the Wisconsin and Alaska stations include search for Alaskan material, with its adaptation to rigorous winters, for use in varietal improvement in Wisconsin.

Tobacco. Havana 501, a cigar-binder type resistant to wild fire, mosaic and black root rot, has been developed [2371].

Strawberry. The new midseason variety Wisconsin Queen has orange-red fruit colour, making it attractive after thawing or processing.

Pinus. Some trees of *P. strobus* whose capacity to transmit resistance to *Cronartium ribicola* to their progeny is above average have been identified.

Cabbage. A detailed account of the development of the club-root and *Fusarium*-yellows resistant cabbage Badger Shipper is provided [cf. 5482]. The starting-point of the project was hybridization of a rogue of cabbage x kale, found in 1941 and possessing recessive multigenic resistance to club root, with cabbage varieties having dominant resistance to yellows.

Spinach. The development of Badger Savoy, Wisconsin Bloomsdale and Savoy Supreme, resistant to bolting and *Peronospora effusa* is announced [cf. 3940].

4341 **Advances in Agriculture. 71st Annual Report of the New Mexico Agricultural Experiment Station for the fiscal year ended June 30, 1960.** Pp. 58.

Sorghum. An Early Hegari x Midland cross and selections derived from Finney, Early Kalo and Club performed well in the breeding nursery at the Plains Substation. Methods of screening for resistance to *Macrophomina phaseoli* are described; 25 lines which appear to have resistance to the disease have been selected.

Lucerne. Evidence which indicates that self fertility is a heritable character was obtained. Recurrent selection was shown to be an efficient breeding method for increasing resistance to bacterial and *Fusarium* wilt in a relatively susceptible population. Of 115 lines tested for their reaction to these diseases, 56–193–0, a selection from Zia, was most resistant. Screening continued for resistance to *Therioaphis maculata* [cf. 1571]. Laboratory tests indicated that resistance to this aphid may be due to the presence of a toxic material or materials.

Cotton. Acala 1517D, which was released in 1960, is superior to Acala 1517C in fibre length, uniformity and micronaire fineness, as well as in some other characteristics. The new variety is moderately tolerant of *Verticillium* wilt but is susceptible to races 1 and 2 of *Xanthomonas malvacearum*. Race 1 of this pathogen was more prevalent than race 2 in 1958–59. Varieties obtained from eastern and western areas of the US were crossed with Acala 1517C and 1517D. Crosses involving the western variety Acala 4–42 and the eastern lines Empire, Coker 100 and Deltapine 15, gave excellent results. The highest degree of hybrid vigour was shown by the interspecific cross Acala 1517C x Pima 32. Attempts to produce hybrid cotton seed through the use of the chemical gametocide FW450 were relatively unsuccessful. A programme for the development of a rapidly germinating, salt-tolerant variety has commenced.

Sugar beet. Varietal differences in resistance to curly top are reported.

Chilli. A number of high-yielding, high-quality lines have been developed as a result of crosses involving Sandia A and B and local strains.

Pecan. Two new varieties, Mesilla (Onliwon x Humble) and Rincon (Delmas x Onliwon), were released in 1959. Mesilla is early maturing, prolific and resistant to the black pecan aphid. The variety produces large nuts with medium-thin shells. Shelling quality is good. The current growth is somewhat susceptible to freezing injury but one-year-old wood is relatively resistant. Rincon trees are vigorous and hardy and produce medium-sized nuts with shells of medium thickness. Shelling quality is high. A number of other promising selections are being tested.

Onion. Four White Grano inbred lines, carrying the gene for pollen sterility, were selected as suitable parents for the production of hybrid lines. Resistance to pink root (*Pyrenochaeta terrestris*) together with the male-sterility factor was found in 43 White Grano x Crystal Wax L303A selections.
Tomato. The highest-yielding variety in a 30-entry trial was V10, a new line resistant to *Verticillium albo-atrum.*
Pinto bean. A new rust-resistant selection, 56–775, appears to possess most of the favourable characteristics of UI111, a rust-susceptible commercial variety; it is being considered for release in the Deming area. Screening for resistance to rust and powdery mildew continued.

Nuevos progresos de los trabajos de investigación y experimentación agrícola que realiza la Estación Experimental Agrícola de la Asociación de Agricultores de Cañete. (Marzo de 1958 a Mayo de 1959). [**Further progress in agricultural research and experimental work being carried out by the Agricultural Experiment Station of the Association of Agriculturists of Cañete. (March 1958 to May 1959)**].
1959 : No. 2 : Pp. 56. (Mimeographed).

4342 *Boza Barducci, T. Contribuciones de la Estación Experimental a la solución de algunos problemas importantes de la agricultura cañetana.—Proyectos futuros.* (*Contributions of the Experimental Station to the solution of some important problems in the agriculture of Cañete. Future projects*). (*pp. 3–12*).
Maize. The top cross Cañete 2 [cf. XXVIII, 3960] has now become the standard variety in the Cañete valley.
Potato. The hybrid Huasahuasi x Ticanel is now being multiplied.
Cotton. The Cañete selections Cñ281–51 and CP48 gave good results in trials involving 34 varieties, conducted in 1957 in eight cotton-growing areas in Peru. Other outstanding lines were LMW1–52, LM1041–49 and SNA246. Cñ601–51, Cñ70–51 and Cñ629–51 performed well in nematode-infested soils. Selection for resistance to nematodes, *Thielaviopsis basicola* and *Verticillium albo-atrum*, and to complexes of these pathogens, continued.
Phaseolus. A total of 1091 collections of the variety Canario are being studied for nematode resistance.

4343 *del Carpio Burga, R. Algunas reflexiones sobre los resultados de la experimentación agronómica y genética en actual realización y sobre su importancia práctica para la agricultura del valle.* (*Some reflections on the results of the agronomic and genetic research now being carried out and on its practical importance to the agriculture of the valley*). (*pp. 13–19*).
Breeding, selection and varietal trials of maize, sorghum, rice, potato, sweet potato, cotton, sugar cane, castor oil plant, sesame, sunflower, groundnut, melon, water melon and tomato are reported briefly.

4344 BARCROFT, A. L.
Annual Report of the Department of Agriculture of the Federation of Malaya for the year 1959 (1961) : Pp. vii + 101.
Rice. Work on variety testing, pure-line selection and selection of *indica* x *japonica* hybrids and of hybrids between local *indica* varieties is reported. Progenies from X-irradiated Siam 29 x normal Siam 29 were maintained with a view to initiating ear-row selection in the near future.
Cacao. At the Federal Experiment Station, Jerangu, hybrids of Upper Amazon with Trinitario, Criollo or Amelonado were usually highly vigorous compared with other seedlings, but cuttings of ICS clones and Upper Amazon (Malayan) selections also showed satisfactory growth.
Oil palm. Tests of dura, semidumpy x dumpy, semidumpy x semidumpy and other progenies continued.

4345 **Report of the Waite Agricultural Research Institute, South Australia 1958–1959** : Pp. 58.
Wheat. The wheat collection at the institute now comprises 3000 varieties [cf. XXX, 208]. Crosses have been effected between three Australian tester varieties and a range of introduced lines, with a view to developing hybrid combinations with varying percentages of "Australian" and "introduced" genes.
Barley. Information on the general and specific combining ability of a number of varieties is being utilized in the development of improved hybrid lines. The rate and evenness of germination, important factors in the malting process, were shown to be genetically controlled. Reference is made to a new statistical technique which permits an early assessment of germination behaviour.

Potato. Studies on recombination between strains of potato virus X are reported. Genetic markers suitable for the differentiation of strains 1, 2 and 3, are listed.

Pea. Wilt-resistant lines have been developed as a result of a hybridization programme involving the Australian wilt-susceptible varieties Greenfeast and Victory Freezer, and New Era, an American variety resistant to *Fusarium oxysporum* f. *pisi* race 2.

4346 Hicks, F. W.
Annual Reports of the Department of Agriculture, Tasmania, for 1958–59 : Pp. 54; and **1959–61** : Pp. 56.

In addition to the results reported below, mention is made of varietal trials involving field, vegetable and fruit crops.

Wheat. In a trial at Cressy, four stem-rust resistant selections outyielded the control variety Macquarie. At Sassafras, selection 54–25 (Hope x Braemar Velvet) showed very high resistance to stem rust.

Forage grasses. Screening and selection of *Lolium perenne* and *Dactylis glomerata* are reported.

White clover. Three lines obtained from the Mediterranean region were superior to New Zealand Certified in productivity during the autumn and early spring.

Turnip. The varieties Bell Purple Top, Tankards, N.Z. Purple Top and Yellow showed apparent resistance to white rust (*Albugo candida*).

Potato. A number of new selections gave promising results in trials conducted at the Elliott Research Farm. Seedlings were screened at Tewkesbury for resistance to late blight, leaf roll and virus Y.

Hops. A number of promising polyploid lines have been obtained and are now undergoing further testing.

Cabbage. Two hoary-leaved wild cabbage lines showed resistance to the cabbage white butterfly (*Pieris rapa*).

French bean. Ten varieties are listed in order of decreasing susceptibility to *Fusarium solani* f. *phaseoli*, the least susceptible being Hawkesbury Wonder and Pearl Green.

4347 **Biennial Report of the Hawaii Agricultural Experiment Station, 1958–60** (1960) : Pp. 87.

Mention of new varieties already referred to in *Plant Breeding Abstracts* is omitted below.

Pasture legumes. Content of β-nitropropionic acid has been found to be genetically determined (species not given). Flowering in white clover has been shown to be under genetic control [XXX, 4047; XXXI, 3491–92].

Sweet potato. Clones have been tested for the possible recovery of types improved in yield, subsequent to exposure of roots to Co^{60} [cf. XXX, 2895]. Over four generations, the clone first found superior to all others has continued to give significantly better yields.

Macadamia. Of the 29 clonal selections recently made from seedling trees in Hawaii, California and Australia, 18 belong to *M. integrifolia* and 8 to *M. tetraphylla*, while the remainder are hybrids between the two species. HAES selection 660, the best new selection at an advanced stage of testing, is outstanding for its nut characteristics.

Papaya. Promising inbreds and F_1 hybrids between inbreds are under investigation.

Cauliflower. An improved strain of Pua Kea [XXIV, 1493; XXV, 876] has been selected under unusually warm summer conditions in the Manoa Valley, Honolulu. The strain, designated Pua Kea 75, produces a larger percentage of good curds at low altitudes during the summer.

Cucumber. Selections carrying genes for resistance to both *Erysiphe cichoracearum* and cucumber mosaic virus have been obtained but are not yet true breeding for these and other characters.

Tomato. An apparently dominant type of resistance to bacterial wilt found in a "small-fruited, wild tomato" has been used in breeding. Difficulty has however been encountered in combining this type of bacterial-wilt resistance with resistance to root-knot nematode, possibly because of unfavourable linkage. Inbred lines breeding true for resistance to tobacco mosaic, common races of nematode, *Fusarium oxysporum*, *Stemphylium solani* and spotted-wilt virus are being selected for tolerance of *Alternaria* blight and reduced susceptibility to concentric fruit cracking. Several new hybrids with resistance to at least seven diseases have recently been made available for testing in Hawaii and other tropical countries.

Lima bean. A single dominant gene appeared to control resistance to root-knot nematode.

4348 Mórász, S.
Emlékezés Fleischmann Rudolfra. (**In memory of Rudolf Fleischmann**).
Növénytermelés 1961 : **10** : 1–2.

A note on the Hungarian breeder, who died in 1950, is presented.

4349 Pujdokajte, A. A.
(A memorial to a plant breeder).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 2 : 77–78. [Russian].

A biography of the late Lithuanian plant breeder D. L. Rudzinskij, whose memorial was erected at Dotnuva in 1959, lists standard varieties of wheat, oat, flax and peas which were bred by him before 1935.

4350 Nikolaev, G. S. & Ščeglov, Ju. S.
(A threshing and cleaning machine for plant breeding).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 30–31. [Russian].

In the machine described the ears of a single plant pass over a rotating drum with a rubber surface; the seed then passes over a current of air and the seed that is delivered attains a purity of 99–100%, with few if any injured grains.

4351 Rykov, V. N.
(A drier for small lots of seed).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 4 : 68–70. [Russian].

A simple hot-air drier that will take quantities of from 1 to 10 c. of seed is described and illustrated.

4352 Osborne, T. S.
Improving plants with radiation.
Oak Ridge Atom Industries Sales Corp. 1961 : Pp. 18.

For the benefit of nonspecialists, this booklet offers a succinct review of (1) the practical results of plant irradiation in the USA and other countries, (2) possible uses of radiation in breeding, and (3) some technical aspects, such as types and methods of radiation. A short bibliography is appended.

4353 **Recent studies in India on the application of radiation and radioactive isotopes to mutation induction and to metabolic processes in plants and microorganisms. I. Work done at the Bose institute.**
Sci. & Cult. 1960 : **26** : 150–59.

The review includes a summary of the published results of work on the induction of mutants in rice, jute, oil seeds, groundnut and tomato, and also in *Penicillium*, *Aspergillus* and *Streptomyces*.

4354 Broertjes, C.
Chimaeren en mutatieveredeling. **(Chimeras and mutation breeding).**
Meded. Dir. Tuinb. 1961 : **24** : 291–95.

Two consecutive ionizing radiation treatments are recommended for the production of mutants in vegetatively propagated plants: the first to induce mutation within the tissues, giving rise to chimeras; and the second to bring the mutations into the most favourable position for expression, by causing death of some of the tissues or rearrangement of cell layers.

4355 Suto, I. & Ihara, K.
Studies on artificial mutations in plants induced by radiation. I. Organs and their development stages for induction of mutations by inner radiation with P^{32}.
Bull. Brew. Sci., Tokyo 1959 : **5** : 59–69.

Using barley, hop, *Lilium japonicum* and other plants, an analysis was made of P^{32} accumulation in tissues and organs, with various treatments, such as soaking seeds in the radioactive solution or injecting the solution into the stem so that it was distributed to the developing floral organs or developing embryo. The results led to the conclusion that, for inducing mutations, treatment of the growing embryo by means of stem injection may be expected to be the most satisfactory technique.

4356 Hazina, E. P. & Petrova, L. L.
(Vegetative hybridization as a method of directing heredity in plants).
Nauč. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 174–98. [Russian].

An account is given of experiments on vegetative hybridization of wheat, tobacco, tomato, sweet pepper and melon at Odessa. The results include two high-yielding varieties of sweet pepper, which show improved resistance to *Fusarium*, and a highly productive vegetative hybrid of melon, which is recommended as a standard variety in Odessa province.

4357 Neuzüchtungen. **(New varieties).**
Mitt. Klosterneuburg. : Ser. B 1960 : **10** : 81–82.

Senga Precosa is a new strawberry from Germany; it is very early and the medium-sized fruit is sweet and aromatic. This variety gives a good yield but is susceptible to frost. Lihama, another strawberry from Germany, is early and very vigorous with large fruits having firm,

dark-red flesh and a slightly acid and aromatic flavour. Lihama gives a very good yield.
Gallex, a cucumber from Holland, is free of bitter substances and is resistant to gummosis and anthracnose. The yield of dark-green uniform fruits is about 9% below that of Orion.

4358 HAHN, P. & MILDNER, E.
Neu zugelassene Sorten von Gemüse und Arzneipflanzen 1960 und in der Sortenliste gestrichene Sorten. **(Recently approved varieties of vegetables and medicinal plants in 1960 and varieties removed from the varietal list).**
Dtsch. Gartenbau 1960 : **7** : 269–71.

Some new varieties bred in Germany are described.
Foxglove. The variety 106/54 has a very high content of active glucosides; it varies in habit and the flower colour which may be red, pink or white.
Cabbage. The strain 13/54 is a late white variety which gives high yields and keeps well to the end of March; the head is of good quality with a low proportion of stalk.
Brussels sprouts. The strain 41/52 is rather similar to Meteor and has given high yields even after severe frost; the sprouts are of good quality.
Tomato. Pillnitzer Hellfrucht [Pillnitz Pale Fruit] gives particularly high yields under glass but may also be cultivated in open ground; it ripens medium late to late. The fruit is medium to large in size, smooth, regular in shape and uniformly bright red in colour. In growth habit this variety resembles Rheinlands Ruhm [Rhineland Fame].
Pea. The medium-early marrowfat variety 590 is particularly suitable for mechanical harvesting. It is superior to Kelvedon Wonder in yield of pods and seed and gives a good canned product. The variety 50/70 27 is a late marrowfat pea with a good yield of pods and seed; it is superior to Siegerin [Victor] in all important characters including quality of canned and frozen peas.

4359 BUSTARRET, J.
Le catalogue des espèces et variétés et le Comité Technique Permanent de la Sélection. **(The catalogue of species and varieties and the Permanent Technical Committee on Breeding).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 201–206.

The term variety, as applied to autogamous, allogamous and asexually reproducing plants, is defined. The history and functions of the above-mentioned catologue and committee are discussed.

4360 FASTOVEC, S. N.
(Brief characteristics of crop-plant varieties bred at the institute which have been certified as standards by the State Commission for Varietal Trials).
Naučn. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 372–87. [Russian].

Descriptions are given of wheat, rye, barley, maize, tomato, melon, Sudan-grass and lucerne varieties bred at Odessa which were made standards before 1957.

4361 GELMUND, H.
(The list of recommended varieties).
Sadeh (Field)/Hassadeh 1961 : **41** : 1134–35. [Hebrew].

The role of new varieties in increasing crop yields, the method of assessing new varieties in Israel and the significance of the terms variety, cultivar and strain are among the aspects considered in this general discussion.

4362 ŽUKOVSKIJ, P. M.
(Breeding varieties of cultivated plants for resistance to disease).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 12 : 23–35. [Russian].

Most parasites of cultivated plants have evolved together with their hosts, both host and parasite constituting mixed populations of biotypes which have reached some degree of equilibrium. This is thought to account for the high rust resistance of the Caucasian wheat species such as *Triticum timopheevi*, the blight resistance of Mexican potatoes such as *Solanum demissum* and the rust resistance of Mexican sunflowers such as *Helianthus lenticularis*. Other cases mentioned are the resistance of Mexican tomato species to blight, of America vines to phylloxera and mildews, of *Vitis amurensis* to *Plasmopara amurensis*, of *Avena byzantina* to rust, of Argentine forms of *Solanum andigenum* to nematodes and of the wild Himalayan sugar canes to mosaic. The resistance of Chinese apples and pears to scab may possibly be ascribed to the same causes. By applying this principle it is possible to make more rational collections of material for use in breeding.
The importance of biotypes of the parasite is exemplified by the appearance of new races of

wheat rust in North America, Kenya, Australia and Argentina, of potato blight in the Soviet Union and of wart disease of potatoes in the Soviet Union and Germany. The use of interspecific crossing in breeding resistant varieties is illustrated by wheat, tobacco and cotton, special reference being made to the success of Sears in transferring rust resistance from *Aegilops umbellulata* to bread wheat [cf. XXVIII, 184], and favourable comment is made on the work being done by FAO in organizing collecting expeditions.

4363 ISLAM, A. S.
Induced polyploidy and its utility in plant breeding.
Agriculture, Pakistan 1960 : **11** : No. 4 : 607–21.

The effect of colchicine-induced chromosome doubling on the morphology, physiology and productivity of plants is discussed.

4364 MÁNDY, GY. & PÁL, GY.
Sóoldatok hatása a rozs, a zab és a napraforgó fajták csírázására. (**The effect of salt solutions on the germination of rye, oat and sunflower varieties**).
Növénytermelés 1960 : **9** : 343–58.

The effect of different concentrations (0·1–3·0%) of NaCl, KCl and KNO_3 upon percentage germination at 20° C. in four oat varieties, five rye varieties and four sunflower varieties was studied. Rye was the most tolerant of high concentrations and showed little intervarietal difference in reaction. Sunflower varieties varied in response, germination of some varieties being stimulated by low concentrations of KNO_3. Among the oats, the drought-resistant variety Székács 8 was the most tolerant of high concentrations of NaCl. In oats and sunflower, the delay in onset of germination increased with concentration while the duration of germination decreased. The reverse was true of rye.

4365 SIMMONDS, N. W.
Mating systems and the breeding of perennial crops.
Advanc. Sci. 1961 : **18** : 183–86.

In this discussion of the breeding systems of perennials particular reference is made to clonal propagation and its genetic consequences. A number of examples of sexual abnormalities in perennials are tabulated. Means of utilizing the advantages of inbreeding and clonal-propagation systems, while minimizing the disadvantages, are discussed.

4366 MUSIJKO, A. S.
(**Supplementary pollination of agricultural plants**).
Naučn. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. **3** : 199–219. [Russian].

[Cf. XXVI, 3069].

4367 GOLUBEV, V. N.
(**The morphogenetical characteristics of tuberiferous plants**).
Bjull. mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1960 : **65** : No. 5 : 81–91.

The morphological features of a number of tuberiferous species are described, different types being recognized according to the organ that has been modified. Species falling within the same group are often related systematically and presumably phylogenetically. The tuberiferous species *Trifolium lupinaster* is systematically allied to the primitive species of section *Lupinaster* and the tuberiferous character is regarded as a derived feature. The same conclusion applies to many other tuberiferous species, which are thought to have originated independently in a number of different phyla.

4368 JONARD, P.
Commentaires sur la législation du commerce des semences en France. (**Comments on legislation affecting the seed trade in France**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 207–12.

A detailed account is given of legal measures enacted in France for the protection of plant breeders.

4369 TESSI, J. L., RODRIGUEZ AMIEVA, P. J. & FRECHA, J. H.
Observaciones realizadas a campo e invernáculo durante 1960, sobre las variedades de cereales y lino incluidas en el Ensayo Territorial de Resistencia a las Enfermedades. (**Field and greenhouse observations made during 1960 on cereal and flax varieties included in the Territorial Disease Resistance Trial**).
Bol. Inform. Inst. Fitotec., Castelar 1961 : No. 17 : Pp. 22. (Mimeographed).

Tabulated data are provided on the incidence and severity of fungal diseases on numerous varieties and new selections of wheat, barley, oats, rye and flax in various parts of Argentina. Of 196 wheat selections tested for their reaction to races 11, 15, 17 and 17G of *Puccinia graminis* and races 2, 5, 20, 57, 20L and 20T of *P. triticina*, only RPM2478 and RPM2481 showed resistance to all races.

Jord—Gröda—Djur. Aktuella praktiska resultat från svensk jordbruksforskning. Årsbok 1960. (**Soil—Crops—Animals. Current practical results in Swedish agricultural research. Yearbook 1960**). Pp. 279.

4370 *Umaerus, V. & Åkerberg, E. Resistensförädling hos åkerbruksväxter. (Resistance breeding in field crops). (pp. 45–54).*

A popular review is presented of types of resistance, methods of breeding and work in progress in Sweden on cereals, potato, root crops, flax, rape, forage legumes and pea.

4371 ALIKHANIAN, S. I., ORLOVA, N. V., MINDLIN, S. Z. & ZAITAEVA, Z. M. **Genetic control of oxytetracycline biosynthesis.**
Nature, Lond. 1961 : **189** : 939–40.

Treatment of *Actinomyces* (*Streptomyces*) *rimosus* with ultraviolet or X rays or with ethyleneimine at the All-Union Antibiotics Research Institute, Moscow, induced "zero" variants which had practically lost the ability to produce oxytetracycline. The variants were divisible into a "white" group, with a white aerial mycelium, and a "black" group, possessing a greyish aerial mycelium and excreting very dark pigment into the culture fluid. When two white mutants were grown in mixed culture, exceedingly little or no antibiotic was produced, but when black and white mutants were grown together, oxytetracycline synthesis showed a considerable increase. With transferences of the mycelium of a black mutant into the culture fluid of (1) each of two white mutants and (2) the active initial strain, synthesis of oxytetracycline occurred. No synthesis was detected when the mycelium of a white variant was transferred to the culture fluid of the black one. It is assumed that the white mutants and active initial strain produced some unknown substance necessary for antibiotic synthesis by the black mutant.

Report of the Fifth International Symposium on Plant Nematology held on August 10–13, 1959 at Uppsala.
Nematologica, Leiden 1960 : Suppl. II : Pp. 148.

4372 *Goffart, H. Populationsveränderungen des Kartoffelnematoden* (Heterodera rostochiensis *Woll.*) *beim Anbau nematodenresistenter und nematoden-anfälliger Kartoffelsorten unter Berücksichtigung des Auftretens aggressiver Biotypen. [Population changes of the potato nematode* (H. rostochiensis *Woll.*) *with cultivation of nematode-resistant and nematode-susceptible potato varieties with reference to the occurrence of aggressive biotypes*]. (*pp. 76–83*).

When resistance-breaking nematodes represented 1–2% of the population, cultivation of the resistant strain 18/53, Oberarnbacher Frühe [Oberarnbach Early] x (Record x *Solanum andigenum* 'CPC 1673–1'), reduced the population by about 90% in one year. The decrease was lower when the resistance-breaking nematodes were more frequent. A root extract of 18/53 had a greater effect in inducing hatching of the cysts than exudates from more susceptible varieties.

4373 *Dunnett, J. M. Potato breeders' strains of root eelworm* (Heterodera rostochiensis *Woll.*). (*pp. 84–94*).

A standard level of resistance to *Heterodera rostochiensis* is defined and conditions are laid down for the assessment of resistance. From experiments conducted at the Scottish Plant Breeding Station, using two eelworm populations (one aggressive, one nonagressive), it is concluded that *Solanum multidissectum* can be classed with *S. tuberosum* ssp. *andigenum* 'CPC 1673' for resistance type, both species being sources of the standard level of resistance to certain specified eelworm populations only; resistance is conferred by one or few genes and is not dependent on the failure of larvae to hatch at a normal rate in the vicinity of the roots of resistant plants. *S. sanctae-rosae* can be classed with *S. vernei* in that the resistance of both appears to be polygenically controlled and proof against known variation in the pathogenicity of the eelworm.

4374 *Kuiper, K. Resistance of white clover varieties to the clover cyst-eelworm*, Heterodera trifolii *Goffart.* (*pp. 95–96*).

Of 100 clones selected for their good performance in the Netherlands, none was completely resistant to *H. trifolii*. Eight clones however were only lightly infected; these were Lodi Øtofte from Denmark (2 clones), NFG from Germany, Kersey and S100 from Great Britain, an unnamed variety from Hungary, New Zealand certified mother-seed and Ladino from the USA.

4375 NOVIKOV, V. A.
(The third and fourth developmental stages in plants and the conditions required for completing them).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 46–53. [Russian].

A sensitive stage has been discovered in cereals during the formation of the pollen mother cells, the decisive factor being light intensity. This phase does not follow immediately upon the light stage and consequently is termed the fourth stage, the interval between the two being the third stage. The third stage requires a higher temperature than the light stage and requirements for boron, phosphorus and other minerals are also different. Types of varietal response have been shown to be inherited and reference is made to plants of *Avena sativa* 'Golden Rain' which when removed to a 12 hr. day during the third stage formed naked grains, a characteristic which was transmitted to ten succeeding generations. In another experiment cucumber plants subjected to short-wave radiation during the third phase gave progenies with increased resistance to mild frosts.

CEREALS

4376 CUSSEN, G.
Report of Cereal Station, Ballinacurra, 1958.
J. Dep. Agric. Éire : Autumn 1960 : **57** : 131–41.

Wheat. Chinese x *Aegilops umbellata* showed complete resistance to *Puccinia triticina*, while a number of Redman x Hybrid 27 selections were resistant to *P. graminis*. An intensive breeding programme, designed to produce improved spring-wheat varieties, is in progress [cf. XXIX, 3600].
Barley. No useful types were produced as a result of the exposure of XC–11 to neutrons. Some promising lines were however selected from neutron-treated Beorna. Among lines which performed well were two Hunter x XC–11 selections, 39 and 62. Reference is made to the characteristics of a large number of other crosses [cf. XXIX, 3600]. The results of variety trials, including the European Brewery Convention trial, are reported.

4377 KIRIČENKO, F. G.
(The breeding of hard winter wheats and some problems of breeding cereals).
Agrobiologija (Agrobiology) 1960 : No. **3** : 328–31. [Russian].

Mičurinist and other methods used in breeding wheats and other cereals at Odessa are discussed. In particular, work on hard winter wheats has continued [cf. XXX, 1437]. Mičurinka [Mičurinist] has now been released as a standard variety and families of other hard winter-wheat hybrids have been selected for winter hardiness, quality and productiveness; these will be used for breeding other varieties of hard winter wheat, without resorting to soft wheats as the hardy component for crossing. Mention is made of promising soft winter wheats obtained by training spring wheats for winter habit; also mentioned is a winter wheat of unspecified origin having exceptionally stiff straw which will be used in breeding for lodging resistance. Other new varieties of cereals bred at Odessa include the winter barleys Pallidum 14/1 and 14/31 which exceed Odessa 17 in winter hardiness.

4378 EFRAT, Y.
(The improvement of cereals in Israel).
Sadeh (Field)/Hassadeh 1961 : **41** : 1027–29. [Hebrew].

The principles of individual, mass and recurrent selection, as applied to cereal breeding, are summarized. Problems in improving quality and disease and drought resistance in wheat and barley are discussed, with particular reference to Israeli requirements.

Annual Report and Minutes of the 1960 Annual Meeting of the Canadian Seed Growers' Association held at the University of New Brunswick Fredericton, N.B. June 15, 16, 17, 1960 : Pp. 74.

4379 *Sterling, J. D. E. Cereal grain breeding for the Maritimes. (pp. 22–24).*

Breeding cereal varieties for the Maritime Provinces of Canada is reviewed, a discussion being given of such problems as resistance to jointworm (*Harmolita hordei*) and *Helminthosporium sativum* (*Cochliobolus sativus*) in barley and to *Septoria avenae* (*Leptosphaeria avenaria*) in oats, lodging resistance in oats and barley and improved threshability in barley.

4380 *Young, L. C. The national potato breeding program. (pp. 25–29).*
After outlining the organization and aims of the potato-breeding programme centred at the Fredericton Station, NB, the author reports on breeding for resistance to late blight, common scab, leaf roll and other viruses.

4381 **New corn hybrid and oat variety released.**
Crops & Soils 1961 : **13** : No. 6 : p. 21.
Tennessee 604, an early-maturing, yellow maize hybrid released by the University of Tennessee, outyielded Dixie 22 during a 3-year trial period. The new hybrid stands well and carries its ears uniformly low on the stalk; it produces grain of high quality. Blount, a short, stiff-strawed oat variety developed at the Tennessee Agricultural Experiment Station, is reported to be slightly later maturing, less winter hardy but higher yielding and more resistant to lodging than Forkedeer.

4382 Pascale, A. J. & Damario, E. A.
Características bioclimáticas de las avenas, cebadas y centenos cultivados en la República Argentina. **(Bioclimatic characteristics of oats, barleys and ryes cultivated in the Republic of Argentina).**
Rev. Fac. Agron. La Plata 1960 : **36** : 9–31.
Detailed information, based on observations at Castelar during 1952–54, is provided on the photoperiodic and temperature requirements of seven varieties of oats, seven of barley and four of rye.

4383 Cauderon, A., Moule, C. & Vincent, A.
Les céréales. **(Cereals).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 109–10.
In this discussion, emphasis is placed on the need for a better understanding of the physiological problems involved in cereal breeding.

4384 Andrews, J. E.
Note on a portable sheaf drier.
Canad. J. Pl. Sci. 1961 : **41** : p. 452.
Developed at the Canada Department of Agriculture Research Station, Lethbridge, Alta., the portable drier described has been used extensively for drying sheaves from cereal breeding plots.

4385 Martynenko, M. S.
(The problem of vegetative hybridization of cereals).
Trud. Vses. nauč.-issled. Inst. saharn. Svek. (Proc. All-Un. sci.-res. Inst. Sug. Beet) 1959 : **34** : 278–85 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G320 : p. 31. [Russian].
A technique of embryo transplantation where dough is used instead of the endosperm of the graft component is described.

4386 **Detailed descriptions of varieties of wheat, barley and oats recommended by the National Institute of Agricultural Botany.**
Supplement 1961 : unpaginated.
A further supplement to the handbook published in 1954 [XXV, p. 456] gives revisions of the lists of recommended wheats, oats and barleys and descriptions of the three additions: the winter oat Pennant [cf. 1376]; the winter oat Barnwell, developed from Grey Winter x S172 at the Plant Breeding Institute, Cambridge; and the spring barley Union, bred from (Weihenstephaner mildew-resistant CP x Ackermann's Donaria) x Firlbecks III by J. Firlbeck, Gut Rinkam bei Straubing, Germany, and included in the Official German List in 1956. Barnwell is slightly later in ripening, shorter in the straw and considerably more resistant to lodging than S147. It has shown similarity to S147 in resistance to *Erysiphe graminis* and a high degree of resistance to *Ditylenchus dipsaci*. About 5 days earlier in ripening than Proctor, Union is much less susceptible to *E. graminis*.

4387 **Seed bulletin. Winter sown cereals.**
IVRO Wageningen 1961 : Pp. 20.
Seed bulletin. Spring sown cereals.
Ibid. 1961 : Pp. 24.
Varieties of wheat, barley and rye admitted to the Netherlands Descriptive List of Varieties of Field Crops [cf. 4069], or undergoing trial prior to admission, are described. The varieties referred to below are new.

The spring wheat MGH 50–14 (Minister x Peko) has large red grain of good quality, yields well, particularly on heavy soils, has fairly short stiff straw, ripens late and is well suited to combine harvesting. Cleo and Hector, both from Heine VII x Minister, are winter varieties with large red grain and high yields; Cleo has fine but fairly resilient straw and Hector has moderately stiff straw and is leafy. Another winter variety, Sambo (Heine VII x Polonium) has short, stiff, resilient straw, yields very well and tillers abundantly, but is susceptible to shattering. The Belgian winter wheat Stella from (Desprez 80 x Prof. Delos) x (Bastard II [Hybrid II] x Prof. Delos) also gives high yields and has fine, moderately stiff resilient straw, shows rapid initial development and ripens early. All these varieties are fairly hardy.

Very high yields on heavy soils are given by the oat CIV1688 (Marne x Abed Minor), which has large plump white grain of good quality and short, very stiff straw; it ripens rather late and requires fairly heavy doses of nitrogen.

The spring barleys suitable for malting or fodder are: Bock (Rika x Piroline), which has fairly short stiff straw and gives high yields on heavy soils; and Volla, a German production from Wisa x Haisa, which gives very good yields and shows good drought resistance and low susceptibility to mildew.

4388 PORSCHE, W., SCHULZE, R. & LAU, D.
Qualitätszüchtung bei Roggen, Weizen und Braugerste. (**Breeding for quality in rye, wheat and malting barley**).
Dtsch. Landw., Berl. 1961 : **12** : 132–36.

The present position in Germany with regard to breeding for quality is surveyed, mention being made of some promising new strains.

4389 **1960 Report of the Grain Research Laboratory, Board of Grain Commissioners for Canada, Winnipeg, Manitoba 1961** : Pp. 82.

The report includes information on (1) improvements in experimental milling techniques for wheat and (2) the results of quality tests on named and experimental varieties of hard red spring and durum wheats and of barley.

4390 NOWAKOWSKI, K.
Współczesne kryteria oceny wartości przemiałowej pszenicy i żyta ze szczególnym uwzględnieniem potrzeb hodowli. (**Present-day criteria for the estimation of milling quality in wheat and rye, with special reference to breeding requirements**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 77–87.

Methods of testing for milling quality are reviewed for the benefit of Polish readers.

4391 JANICKI, J. & KAMIŃSKI, E.
Zawartość różnych form azotu w niektórych odmianach pszenicy i żyta.
(**The contents of different forms of nitrogen in some varieties of wheat and rye**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 595–609.

Data on total N, protein N, nonprotein N and contents of individual aminoacids are given for seven wheats and two rye varieties grown at four stations in Poland. Protein content varied with variety and with environment.

4392 JANICKI, J. & KAMIŃSKI, E.
Występowanie witamin B_1, B_2, PP i E w ziarnie niektórych odmian pszenicy i żyta w świetle nowych kryteriów analitycznych. (**The occurrence of vitamins B_1, B_2, PP and E in the grains of some wheat and rye varieties in the light of new analytical criteria**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 53–64.

Data on the contents of the above vitamins in seven wheats and two ryes grown in different regions of Poland are given.

4393 KAVANAGH, T.
Inoculating barley seedlings with *Ustilago nuda* and wheat seedlings with *U. tritici*.
Phytopathology 1961 : **51** : 175–77.

A vacuum method of inoculating seedlings is described, by means of which it is possible to avoid the disadvantages of floret inoculation. Grains were germinated until the coleoptiles were ½–1 cm. long. About 2 mm. of tissue was cut from the tip of the coleoptiles. The seedlings were then immersed in a suspension of chlamydospores and placed in a vacuum. After 2 minutes, the pressure was suddenly restored. The time from inoculation to chlamydospore formation was only 6–8 weeks, as against 6–12 months in the case of floral methods of inoculation. Attention is drawn to the value of the method for the breeder.

4394 KAVANAGH, T.
Temperature in relation to loose smut in barley and wheat.
Phytopathology 1961 : **51** : 189–93.

Temperature was found to have an important influence upon chlamydospore production of *Ustilago tritici* and *U. nuda*. With various high-temperature treatments during host development, differences were observed between barley varieties and between wheat varieties in (1) susceptibility to leaf infection and (2) degree of the adverse effect of such treatments upon sorus and chlamydospore formation. The data on barley pointed to the possibility of breeding varieties resistant to *U. nuda* by exploiting the inability to produce sori or production of only a few sori at a moderately high temperature such as 75° F., some evidence being obtained which suggested that this reaction may be heritable.

4395 Hermansen, J. E.
Urediospore germ tube fusion between the varieties *avenae* and *phlei-pratensis* of *Puccinia graminis*.
Friesia 1957–58 : **6** : 30–32.

Fusions between hyphae of the two varieties were frequently observed on agar-covered slides and also on leaves of *Lamarckia aurea*.

4396 Hermansen, J. E.
Studies on cereal rusts in Denmark. I. Physiological races in 1958–1959.
Årsskr. k. Vet.- o. LandbHøjsk., Kbh. 1961 : 99–105.

Races of *Puccinia graminis* var. *tritici*, *P. recondita*, *P. hordei*, *P. graminis* var. *avenae*, *P. coronata* var. *avenae* and *P. striiformis* which were identified during 1958–59 are listed.

4397 Gerechter, Z. K., Levine, M. N., Minz, G., Schreiter, S. & Wahl, I.
Parasitic specialization of the major cereal rusts in the state of Israel.
Robigo, Castelar 1961 : No. 11 : 15–19; also in Spanish, 19–20.

The most prevalent races of four cereal rusts identified in Israel between 1956 and 1959 were as follows: *Puccinia graminis* var. *tritici*, 14, 21 and 17; *P. recondita* var. *tritici*, 26, 107 and 20; *P. graminis* var. *avenae*, 6, 8 and 2; and *P. coronata* var. *avenae*, groups 263–264–276 and 202–203 and individual races 286 and 270.

4398 Guthrie, E. J.
Races of *Puccinia graminis tritici* and *Puccinia graminis avenae* in Kenya.
Robigo, Castelar 1961 : No. 11 : 5–6; also in Spanish, 6–7.

Races 11, 14, 21, 24, 34, 40 (three subraces), 42, 122 (somewhat different from normal 122), 143, 184 and 189 of wheat stem rust were identified in 1959. Races of oat stem rust identified in the same year were 6, 6A and 13A.

4399 Miller, C. W.
A simple shade device.
Robigo, Castelar 1961 : No. 11 : p. 7; also in Spanish, p. 8.

A cover made of cheesecloth and shredded paper, suitable for reducing light intensity without affecting temperature, is described. The device should prove useful in studies of environmental influences on the reaction of wheat plants to stem rust.

4400 Wood, E. A. (Jun.).
Description and results of a new greenhouse technique for evaluating tolerance of small grains to the greenbug.
J. econ. Ent. 1961 : **54** : 303–05.

Details are given of the technique used at the Oklahoma Agricultural Experiment Station for evaluating varieties for tolerance of *Toxoptera graminum*. Varieties to be tested are grown in flats, each measuring 14 x 20 x 3¾ in., and are infested at emergence by sprinkling about 2000 aphids uniformly over each flat. The insects are not caged but allowed to migrate freely from plant to plant to simulate infestation under field conditions. Number of days for which the plant survives serves as measure of tolerance, plants destroyed within two weeks being regarded as susceptible. Plants approaching the control in tolerance are transplanted to pots. Seedlings from these individuals are again tested to ensure that tolerance is retained. In breeding, tolerant lines are crossed with varieties having desirable agronomic characters and the segregating generations screened in the greenhouse for tolerance. Tolerant segregates and their parents are then grown in the field, infested barley stalks being scattered evenly over the plots. With this method, selection for winter hardiness, drought resistance and other characters, in addition to aphid tolerance, may be effected.

About 8000 entries in the world collection of wheats have been assessed for reaction to the pest by the greenhouse technique. Five varieties of *Triticum vulgare* and 14 of *T. durum* were highly tolerant.

4401 Lindsten, K.
Några synpunkter och iakttagelser rörande "bollnässjukan". (**Some points of view and observations on the Bollnäs disease**).
Sverig. Utsädesfören. Tidskr. 1961: **71** : 53–73.

Studies at Bollnäs, Sweden, suggest that the above disorder, the symptoms of which include dwarfing, profuse tillering and low grain production, is caused by virus IIb, transmitted by the leaf hopper *Calligypona pellucida*. Barley varieties tested, particularly the early six-rowed types, showed good resistance, but all the oat varieties were susceptible, despite variations in tolerance.

4402 GIBLER, J. W., JENNINGS, P. R. & KRULL, C. F.
Natural occurrence of *hoja blanca* on wheat and oats.
Plant Dis. Reptr. 1961 : **45** : p. 334.

White leaf, the insect-transmitted virus disease of rice, was found in 1960 for the first time occurring naturally on wheat and oats, at the Palmira Agricultural Experiment Station, Colombia. Information is given on wheat and oat lines with a high incidence of infection.

WHEAT

4403 MESCH, J.
A tápiószelei buza fajtagyüjtemény vizsgálata. (**A study of the Tápiószele collection of wheat varieties**).
Agrobotanika, Tápiószele 1959 : **1** : 54–93. (Mimeographed).

Studies of earliness, cold tolerance, standing ability and disease resistance in the world collection at Tápiószele, Hungary, are reported.

4404 SOÓS, G.
A nagytermőképességű búzák termesztésének újabb tapasztalatai. (**Recent experiences in growing wheats of high yield capacity**).
Magyar Mezőgazdaság, Budapest 1960 : **15** : No. 15/16 : 7–8; from Hungar. agric. Rev. 1961 : **10** : No. 1 : p. 9. (Abst.).

Results are presented of small-scale and farm-scale trials of Soviet, Italian and Hungarian varieties, conducted in Hungary in 1959 and 1960. Skorospelka 3B [Early 3B], Bezostaja 4 [Awnless 4], San Pastore, Autonomia and Produttore [Yielder] were best.

4405 ANDRIANOVA, K. S.
(**The growing of hybrid winter-wheat material**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 6 : 133–34. [Russian].

Details of this investigation have already been summarized [cf. 1689].

4406 KÖYLIJÄRVI, J.
Vårvetesorterna i sydvästra Finland. (**Spring wheat varieties in south-west Finland**).
Tidskr. Lantm., Helsinki 1961 : No. 5 : 120–22.

The Norwegian variety Norröna was the most productive of five varieties tested in 1955–60. Nora, a derivative of Norröna tested in 1960, has also shown promise.

4407 RASMUSSEN, F.
Sortsforsøg med hvede 1946–59. (**Varietal trials of wheat, 1946–59**).
Tidsskr. Planteavl 1961 : **64** : 1035–55.

Details of the performance of nine varieties tested at 11 stations in Denmark are presented, together with notes on the hardiness, straw properties, grain characters and earliness of each variety.

4408 GIBŠMAN, E.
Rezultati makroogleda sa italijanskim i domaćim sortama pšenice na teritoriji Vojvodine u 1958/59 god. (**The results of large-scale trials with Italian and local wheat varieties in the Vojvodina region in 1958–59**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 409–18.

The outstanding varieties in these trials were Mara, San Pastore, Produttore [Yielder] and Fortunato. Among the newer varieties, Funo, Leone [Lion], Leonardo and Étoile de Choisy showed promise.

4409 BOROJEVIĆ, S., GIBŠMAN, E. & MIŠIĆ, T.
Sortiment Visokoprinosnih pšenica za Vojvodinu.
(**The assortment of highly productive wheats for Vojvodina**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 691–705.

In varietal trials in Vojvodina which included observations on winter hardiness, resistance to lodging and diseases and grain quality, Étoile de Choisy and seven Italian varieties, particularly San Pastore, showed most promise. In addition to growing these varieties, mixed sowings of San Pastore with Fortunato, Mara or Leone [Lion] and Elia with Mara are recommended. San Pastore and Elia were chosen for their cold resistance, the others for grain quality and resistance to lodging.

4410 GEORGE, B.
[**Selection of winter wheat at the Agricultural Research Institute of Rumania (ICAR)**].
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 68–70. [Russian].

A brief account is given of the history and problems of winter-wheat breeding in Rumania. Reference is made to four new, high-yielding ICAR varieties, namely 51T, 642B, 495C and 498C. The State Commission on Varietal Testing is at present conducting trials on a further 10 varieties.

4411 El Khishen, A. A.
Yield tests on some local and introduced varieties of wheat used as parents in wheat breeding projects.
Alexandria J. agric. Res. 1960 : **8** : 137–40.

The results of tests on varieties in different parts of Egypt are summarized. Varieties likely to prove useful as parents were identified on the basis of these results, and the local wheats Giza 139, Mokhtar, Tosson, Hindi 62 and Baladi 116 were crossed with the introduced varieties Thatcher, Ramona, Baart and White Federation.

4412 Boquet
Neuf ans de contribution a l'étude du blé à Madagascar. (**A nine-year contribution to the study of wheat in Madagascar.**
Riz et Rizic. 1961 : **7** : 5–17.

The results of varietal trials, conducted at the Antsirabe Agricultural Station during 1954–59, are reported.

4413 Vincent, A.
Le blé. (**Wheat**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 111–14.

Among the varieties which played a leading role in the development of present-day French varieties are Noé, Rieti, Kreloff, Red Fife, the Vilmorin lines and unspecified introductions from Sweden and Central Europe.

4414 Mišić, T.
Rezultati makroogleda sa stranim sortama pšenice na teritoriji Vojvodine u 1959/60 godini. (**The results of large-scale trials with foreign wheat varieties in the territory of Vojvodina in 1959–60**).
Savremen. Poljopr., Novi Sad 1961 : **9** : 402–14.

Three cold-resistant varieties, Étoile de Choisy, Elia and San Pastore, gave the best results in the above trials.

4415 Kulešov, G. F.
(A study of the population method in winter-wheat breeding).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 6 : 131–32. [Russian].

This is a brief account of studies which have been reported elsewhere [cf. 3166].

4416 Riley, R., Kimber, G. & Chapman, V.
Origin of genetic control of diploid-like behavior of polyploid wheat.
J. Hered. 1961 : **52** : 22–25.

"Chromosome 5 of hexaploid common wheat, *Triticum aestivum*, carries one or more genes which prevent homoeologous chromosomes from pairing at meiosis [cf. XXX, 3795]. This chromosome is in the B genome and was probably derived from a species in the Sitopsis section of *Aegilops*. Consequently, the Sitopsis species may be examined to determine whether any have a genetic influence on meiotic pairing similar to that of chromosome 5. Chromosome pairing has been compared in hybrids between common wheat, with and without chromosome 5, and two Sitopsis species, *A. speltoides* and *A. longissima*.

"Homoeologous pairing occurred in the hybrids involving *A. speltoides* irrespective of the presence or absence of chromosome 5. Therefore, this genotype removes the inhibition of wheat chromosome 5 on intergenome pairing.

"There was no abnormal intergenome pairing in hybrids involving *A. longissima* when chromosome 5 of wheat was present. In its absence, however, the isolation between the genomes broke down. Thus, the *A. longissima* genotype is unable to compensate for the deficiency of chromosome 5 and cannot operate in the same way.

"Apparently none of the possible B genome donors has a genotype which functions like the critical wheat chromosome. Therefore, a number of alternative hypotheses are proposed to account for the origin by mutation of the diploidizing influence exercised by chromosome 5." [Authors' summary].

4417 Ikeda, H.
On the variation and inheritance of amylase activities in wheat.
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 44–52.

In an analysis of ten varieties, determinations of amylase activity in germinating seeds and seedlings placed the varieties in almost the same order. On the basis of data on activity in the leaf blades at heading stage, two groups were recognizable, stronger activity being found in Oku-komugi, Hokuei, Norin 8 [Ministry of Agriculture and Forestry 8] and Akasabishirazu 1 and weaker activity in the remaining six varieties. The correlations of + 0·90 between the activities in germinating seeds and seedlings and of + 0·86 between the activities in germinting seeds and the leaf blades were highly significant. Analysis of F_2 seeds from crosses of Norin 61, a variety having weaker activity, with Akasabishirazu 1, Norin 8 and Okukomugi showed the amylase activity of germinating seeds to be under the control of a single gene, with stronger activity dominant. Temperature and soil type of the habitat influenced activity, the effects of these factors generally disappearing after cultivation under uniform conditions for one or more generations. In a geographical survey of the principal varieties grown in Japan, a correlation coefficient of — 0·73 was found between the activity in germinating seeds and February mean temperature. It is therefore concluded that amylase activity and cold resistance are associated.

4418 Dekaprelevič, L. L. & Naskidašvili, P. P.
(A method of breeding winter wheat for immunity to rust diseases).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. **1** : 42–44. [Russian].

Hybrid lines derived by crossing local ecotypes of the drought-resistant variety Dolis-Puri [Drum wheat] with Ardito, Klein 33, Marquis, Moskovka [wheat from Moscow] and K–VIR–28706 [Chinese Institute of Plant Industry 28706] were tested for resistance to brown and yellow rust at the Georgia Agricultural Institute. Combinations of the Kartalinskij ecotype of Dolis-Puri x Klein 33 showed the highest level of resistance to both diseases, the resistance being retained for 3–4 generations; the outstanding cross was Dolis-Puri 35–4 ♂ x Klein 33 ♀.

4419 Gandhi, S. M., Menon, T. U., Bhargava, P. D. & Bhatnagar, M. P.
Studies on hybrid vigour in wheat.
Indian J. Genet. 1961 : **21** : 1–10.

The F_1s from crosses of 11 Indian and introduced rust-resistant wheats with the high-yielding but rust-susceptible local variety RS31–1 were studied with respect to ten characters at the Central Agricultural Research Station, Durgapura, Rajasthan. Considerable heterosis was found for such characters as height, tillering, grain yield and forage yield, depending upon the cross. EG1440 from Egypt showed the best combining ability for grain yield and E220 from Kenya the best combining ability for forage yield, respectively surpassing the better parent by 35·27% and 35·00%. Another variety from Kenya, C14112, had a depressing effect on all the characters studied.

4420 Starzycki, S. & Wąs, L.
Badania nad hodowlą pszenic ozimych w kierunku poprawienia jakości ziarna. Cz. II. **(Studies on breeding winter wheat with the aim of improving grain quality. II.).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 637–49.

In 1400 F_6 and F_7 lines from crosses involving *Triticum aestivum* sspp. *spelta*, *macha*, *compactum* and *vulgare*, *T. durum* and *T. turgidum*, length of straw generally showed intermediate inheritance, although transgression for this character was observed in some crosses, notably (ssp. *spelta* x ssp. *compactum*) x ssp. *spelta*. Tillering was also usually intermediate in inheritance and showed a correlation with straw length in many crosses. The tendency to form nonheading tillers was a recessive character, as was compactness of the ear. Sspp. *spelta* and *compactum*, both with high 1000-grain weights, gave hybrids with reduced values when crossed together: the same was true for *T. durum* and *T. turgidum*. Within ssp. *vulgare*, which has a low 1000-grain weight, intervarietal hybrids were intermediate between their parents for this character, but improved values resulted from crosses of ssp. *vulgare* with ssp. *compactum* or *T. durum*. [Cf. XXVIII, 1479].

4421 Kiričenko, F. G., Kiričenko, M. S. & Vernidub, L. I.
(The results of work on breeding hard winter wheat).
Nauč. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. **3** : 5–29. [Russian].

[Cf. XXIX, 262].

4422 Šulyndin, A. F. & Potapova, A. A.
(An agrobiological study of interspecific wheat hybrids in connexion with the breeding of hard and soft winter wheats).
Trud. Ukr. nauč.-issled. Inst. Rastenievodstv., Selekc. Gen. (Proc. Ukr. sci.-res. Inst. Pl. Industr., Breed. Genet.) 1959 : **3** : 141–58 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G327 : p. 32. [Russian].

F_1 plants of *Triticum aestivum* x *T. durum* differed in vitality, depending on the soft winter wheat parent. Losses in F_1 are reduced by pollinating immature stigmas with ripe pollen. It is necessary to begin training the hybrids for winter hardiness in the F_1, using the optimum autumn sowing date of the parent with the winter habit. Segregation of the hybrid progeny in respect of winter hardiness and morphological and physiological characters is described. The nitrogen : sugar ratio indicates the hardiness of the hybrids; the ratio in winter hardy forms was 1 : 8 or 1 : 9; in the less hardy forms it was 1 : 2 or 1 : 3. Hard-wheat segregates were more resistant to *Puccinia triticina* than the soft-wheat segregates. Resistance was positively correlated with the time of opening and closing of stomata and with catalase activity. The hard winter-wheat forms were less productive than the soft wheats, and methods intended to improve their productiveness are described.

4423 ŠULYNDIN, A. F.
(Swamping inheritance in distant hybridization).
Agrobiologija (Agrobiology) 1960 : No. 1 : 120–26. [Russian].

Descriptions are given of direct and reciprocal hybrids between the hard wheat Hordeiforme 1426/7 and the soft wheat Alabasskaja which possessed only the characters of Alabasskaja in the F_1 and later generations and gave no segregates of hard wheat or intermediate types in the F_2. Among the F_2 of Hordeiforme 1426/7 ♀ x Alabasskaja ♂ which resembled only the pollen parent a plant was selected for its productive ear and large grain. Its progeny was constant, but while resembling the original Alabasskaja, it differed from this in some economic characters. In particular it was taller and had larger grain. In 1954, 1957 and 1958 the new form of Alabasskaja, which has been named Lutescens 943, outyielded the standard variety Odessa 3; it is winter hardy and resistant to lodging and has good baking properties.

4424 BOROJEVIĆ, S.
Species hibridizacija roda Triticum. III. Pojava razgranatih klasova u ukrštanjima vrsta koje nemaju razgranatih klasova. **(Interspecific hybridization in the genus *Triticum*. III. The occurrence of branched ears in crosses of species having no branched ears).**
Letopis, Novi Sad 1959 : No. 3 : 3–16.

[Cf. XXIX, 941].

4425 MOROZOV, P. V.
(New data on variability in hybridization of hard and soft wheats).
Agrobiologija (Agrobiology) 1960 : No. 3 : 457–59. [Russian].

Hordeiforme varieties of wheat pollinated by a *lutescens* form developed mostly an intermediate type of grain, a small amount of *hordeiforme* grain and a few grains of the *lutescens* type. Plants raised from the three kinds of grain showed great variability in respect of grain and ear characters in the next generation.

4426 JANKOWSKI, S. & ANDRZEJEWSKI, M.
Właściwości chemiczne i technologiczne ziarna kilku krzyżówek pszenic tetra- i heksaploidalnych. **(Chemical and technological properties of grain of several tetraploid and hexaploid wheat hybrids).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 65–75.

Studies were made on vitreousness, content of N, gliadine and gluten and the absorptive capacity of the gluten in *Triticum turgidum*, *T. durum* and various forms of *T. aestivum*, one of them derived from a mixture of several botanical varieties multiplied together; two hybrids, A6/0 and A6/2, from *T. turgidum* var. *linneanum* with *T. durum* var. *hordeiforme* 'Puławska Twarda' [Puławy Hard], were also included. These two hybrids were equal to the parental forms in N content and were often considerably higher in content and imbibition capacity of the gluten; one of them was superior to *T. durum* in meal extraction percentage; the alveograms and farinograms from hybrid AD6/0 were almost identical with those from pure *T. durum* and from a hybrid (*T. durum* var. *hordeiforme* x *T. durum* var. *melanopus*) x *T. durum* var. *melanopus*. Since AD6/0 is a winter form it is regarded as promising for breeding.

4427 WĄS, L.
Ocena ziarna mieszańców międzygatunkowych pszenic metodą Pelshenkego. **(Grain evaluation in interspecific wheat hybrids by the Pelshenke method).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 553–72.

The Pelshenke method as modified by Engelke has been used at the Grodkowice Experimental Breeding Station, Poland, to test the quality of 278 F_6 and F_7 lines from 21 interspecific crosses. Gas-retention, stability and fermentation values of the dough from the hybrids were generally intermediate between the values for the parents. *Triticum aestivum* ssp. *spelta* 'Steiners Roter Tiroler' [Steiner's Red Tyrolese] transmitted high gas retention, high dough stability and low fermentation value to its offspring, and several good-quality lines which thresh well and are of the soft-wheat type have been obtained from its hybrids with Ostka

Złotokłosa [Awned Golden Ear] back crossed to the latter. *T. durum* var. *hordeiforme* 'Puławska Twarda' [Puławy Hard] was also a good parent, and crosses between *T. turgidum* var. *cinereum* and Ostka Złotokłosa have yielded lines of good quality. *T. turgidum* var. *linneanum* 'Dziwo' [Marvel] and *T. aestivum* ssp. *compactum* 'Albit' transmitted poor quality to their progeny.

4428 Watanabe, Y., Mukade, K. & Kokubun, K.
(Studies on the production of amphidiploids as a source of resistance to leaf rust in wheat. V. Cytogenetical studies on the F$_1$ and amphidiploid of *Triticum Timopheevi* Zhuk. x *Aegilops umbellulata* Zhuk.).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 169–73. [Japanese].

Morphological and cytological descriptions are given of the above hybrid and its colchicine-induced amphidiploid. In the untreated F$_1$, $2n = 21$, the modal meiotic configuration being $1_{II} + 19_{I}$; the modal configuration of the amphidiploid is 21_{II}. While the spikes of the amphidiploid resemble those of *T. timopheevi*, disarticulation is as in *Ae. umbellulata*. The amphidiploid is immune against many races of *Puccinia triticina*. Grains were obtained from crosses between the amphidiploid and *T. timopheevi*, *T. vulgare*, *T. compactum*, *T. spelta*, *T. macha*, *T. durum*, *Secale cereale*, *S. montanum* and *Ae. umbellulata*. [Cf. XXIX, 273].

4429 Watanabe, Y., Mukade, K. & Kokubun, K.
[Studies on the production of amphidiploids as a source of resistance to leaf rust in wheat. VI. Cytogenetical studies of the amphidiploid derived from *Triticum timopheevi* Zhuk. x *Agropyron elongatum* (Host.) Beauv. ($n = 7$)].
Ikushugaku Zasshi/Jap. J. Breeding 1960 : No. 10 : 209–14. [Japanese].

A morphological and cytological study of the above colchicine-induced amphidiploid is reported. The modal meiotic configuration is $20_{II} + 2_{I}$. Crosses were effected between the amphidiploid and *T. timopheevi*, *T. vulgare*, *T. compactum*, *T. spelta*, *T. macha*, *T. durum*, *Secale cereale*, *S. montanum* and *A. junceum*, but not with *A. elongatum* or *Haynaldia villosa*. A spontaneous cross with *A. junceum* had $2n = 40$ chromosomes, the modal meiotic configurations being $1_{III} + 6_{II} + 20_{I}$ and $7_{II} + 21_{I}$.

4430 Šulyndin, A. F., Naumova, L. N. & Kartavyh, P. A.
(The fertility of first generation wheat-rye hybrids in connexion with meteorological conditions and choice of parental varieties).
Agrobiologija (Agrobiology) 1960 : No. **3** : 373–78. [Russian].

Considerable differences in the degree of sterility were observed in the F$_1$ of wheat-rye hybrids at Har'kov in 1957 and 1958. In the second year, which was characterized by a mild winter and adequate rainfall and moderate temperatures in the spring and summer, the plants, which were grown on rich soil, had higher sets than those from crosses in the previous year. Most grain was set in the central portions of the ear. The wheat varieties Zenitka Ulučšennaja [Improved Zenith], Alabassakja and Albidum 927 crossed most readily with different rye pollen parents, as indicated by grain sets from artificial or open pollination, but other wheat varieties also formed from 2 to 787 hybrid grains. The effect of the pollen parent upon crossability was less noticeable than that of the seed parent, but minor varietal differences were observed. Higher grain sets were obtained from pollinations of unspecified wheat varieties by the rye varieties Voronež Agricultural Institute, Kazan' 5–6 and Har'kov 194 separately than by mixed pollen of these varieties.

4431 Vettel, F. K.
Mutationsversuche an Weizen-Roggenbastarden (*Triticale*). III. Mutationsauslösung bei *Triticale* Meister und *Triticale* 8324. **[Mutation experiments on wheat-rye hybrids (*Triticale*). III. Induction of mutation in *Triticale* Meister and *Triticale* 8324].**
Züchter 1960 : **30** : 313–29.

The X$_1$ generations showed reduced vigour and fertility and many of the plants died in later stages of development; they were probably sublethal aneuploids. The mutants described were similar to those induced in *Triticale* 'Rimpau' [cf. XXX, 2491]. A few mutants were superior to the parents in early development, tillering, winter hardiness or external grain quality. There was in general a negative correlation between fertility and tillering and in some cases thickening of the ear was accompanied by an increase in fertility. The most fertile forms had the heaviest grain. There were positive correlations between the frequency of euploids, 1000-grain weight and germination capacity and also between the size of the sieve fractions of the grain and the frequency of hyperploids. An abnormal number of roots on the germinating seedling (± 3) was usually accompanied by an irregular chromosome number. [Cf. 3181].

4432 Wilson, J. A. & Ross, W. M.
Cross-breeding in wheat, *Triticum aestivum*. I. Frequency of the pollen-restoring character in hybrid wheats having *Aegilops ovata* cytoplasm.
Crop Sci. 1961 : **1** : 191–93.

One hundred and twenty-four hexaploid wheats were tested for the presence of pollen-restoring genes in crosses with a cytoplasmically ♂-sterile hexaploid wheat, Nr26, which has *Ae. ovata* cytoplasm. While partial ♂-fertility was observed in a few hybrids, no single variety appears to carry the full complement of restoring genes.

4433 Nakajima, G.
(Cytogenetical studies of trigeneric hybrids. IV. Maturation division in pollen mother cells of TperHRF$_1$ plants with $2n = 26 \sim 27$ and $29 \sim 32$ chromosomes).
Senshokutai (Chromosome)/Kromosomo 1960 : **44–45** : 1471–92. [Japanese].

The hybrids are from the cross (*Triticum persicum* x *Haynaldia villosa*) x *Secale cereale* [cf. XXX, 2488–89]. Meiosis is described in hybrids with the above chromosome numbers. The modal bivalent frequencies corresponding to the various chromosome numbers are as follows: $2n = 26$, 0_{II}–2_{II}; $2n = 27$, 0–2_{II}; $2n = 29$, 0–3_{II}; $2n = 30$, 2_{II}; $2n = 31$, 4_{II}; and $2n = 32$, 4_{II}. The genomic constitution of the various hybrids is elucidated.

4434 Nakajima, G.
(Cytogenetical studies of trigeneric hybrids. VI. Maturation division in pollen mother cells of TdurHRF$_1$ plants).
Senshokutai (Chromosome)/Kromosomo 1960 : **44–45** : 1506–19. [Japanese].

Morphological and cytological descriptions are given of hybrids from the combination (*Triticum durum* x *Haynaldia villosa*) x *Secale cereale*. The chromosome numbers and modal bivalent frequencies of the hybrids are as follows: $2n = 24$, 3_{II}; $2n = 26$, 0_{II}; $2n = 27$, 0–2_{II}; $2n = 28$, 0–3_{II}; $2n = 29$, 0_{II} and 3_{II}; $2n = 30$, 0_{II}; and $2n = 32$, 2_{II}. [Cf. 3179].

4435 Cicin, N. V.
(Raising the production of grain crops in all possible ways).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. 3 : 326–37. [Russian].

The merits of some of the *Triticum* x *Agropyron* hybrids are again referred to [cf. XXVI, 274–94]. Hybrid 56 has proved suitable for the Altaj district, where it matures 9–11 days before Milturum–321, 4–7 days before Albidum–3700 and 4–7 before Lutescens–758. It has exceeded the local standards in yield in most areas where it has been tested and has never shown any attack by loose smut; it is also more drought resistant than the standard cultivars.

Hybrid 186 is also distinguished by earliness and large grains, hybrid 599 by resistance to bunt and hybrid 1 by freedom from lodging; in Latvia, hybrid 1 has yielded up to 48·9 c. of grain per ha.

Some of the new selections have up to 35 spikelets per ear, some of them with 11 or more grains per spikelet. Several of the selections with branched ears have proved free from lodging and shedding and are yielding 45–50 c. per ha. of grain of good milling and baking quality.

Rye varieties with branched ears and some of the other hybrids are also mentioned briefly [cf. *loc. cit.*].

4436 Dolgov, S. I.
(New varieties in the Altaj state farm).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 4 : 73–74. [Russian].

Yields corresponding to 23–35 c. of grain per ha. have been produced in the virgin lands of the Altaj region from *Triticum* x *Agropyron* hybrids 172 and 173, corresponding yields from standard wheat varieties being 14–15 c. The hybrids have a higher tillering capacity than wheats such as Albidum 3700 and Milturum 321, their 1000-grain weight is considerably higher, they are free from lodging and shedding and resistant to drought, yellow and brown rust and smut. Their grain quality is higher but their straw quality inferior to those of wheat cultivars.

4437 Karapetjan, V. K.
(Biological effect of ionizing radiation on plants).
Agrobiologija (Agrobiology) 1960 : No. 1 : 82–85. [Russian].

X_1 plants raised from the seed of 28-chromosome wheats, which had been treated with different doses of γ rays, showed the usual depressive effects, sterility and various forms of chlorophyll deficiency. A few plants formed double ears. Differences were observed in X_2 depending on whether the plants were sown as spring or winter crops. In the first instance, the depressive effects were less noticeable in X_2 plants than in X_1 and although mutations occurred they were mostly minor morphological changes. Some plants had double ears but this character was not heritable. Greater effects were induced in X_2 plants which were subsequently sown in the autumn. Changes were observed in respect of plant height, compactness of the ear, fertility and earliness. New forms of wheat included interspecific conversions: *Triticum durum*→*T. vulgare*, *T. durum*→*T. compactum*, *T. turgidum*→*T. dicoccum* and *T. turgidum*→*T. compactum*. The results of the experiments are discussed with reference to Lysenko's suggestion that these agents shatter the heritable basis of the organism and that new heritable characters are formed afterwards by altered environment.

4438 GLUŠČENKO, I. E. & ZAHAROVA, G. M.
(The influence of ionizing radiation on the development of wheat and oat plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 304–10. [Russian].

Exposure of dry grains of the wheat varieties Lutescens 62 and Graecum and the oat variety Pobeda [Victory] to X irradiation led to a marked depression in germinating capacity, growth and development. Among the aberrant types which appeared in the X_1 and X_2 generations were giant (162 cm.) and sterile forms of Pobeda.

4439 KARAPETJAN, V. K.
(The effect of γ-rays on the heredity of wheat).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 311–14. [Russian].

Dry seeds of 26 *Triticum* species and varieties were exposed to Co^{60} γ-irradiation doses varying from 8000 to 20,000 r. Reduction in percentage germination and in subsequent growth was observed in all lines tested though there were wide differences in behaviour between various populations. Aberrant types observed in the γ_1 and γ_2 generations included dwarfs, early and late-maturing lines, forms showing abnormal flowering and compact-eared forms (the latter appearing in the progeny of *T. durum* and *T. turgidum* var. *plinianum*). Speltoids and awnless plants were noted in the progeny of the awned *T. durum* varieties Hordeiforme 496 and Melanopus 069.

4440 KARAPETJAN, V. K.
(The effect of γ-rays on soft wheat and rye).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 315–18. [Russian].

Details are given of varietal differences in the germinative capacity and overwintering ability of the γ_1 and γ_2 generations derived from seed of 10 winter-wheat and three rye varieties subjected to Co^{60} γ-irradiation. Brief mention is made of dwarfs, sterile plants, awnless and lax-eared forms, early and late-ripening lines and other variants observed.

4441 JAGATHESAN, D., BHATIA, C. & SWAMINATHAN, M. S.
Effect of induced awn mutations on yield in wheat.
Nature, Lond. 1961 : **190** : p. 468.

In investigations at the Indian Agricultural Research Institute, New Delhi, fully awned mutants of NP799 and NP809 have been obtained in the R_2 derived from seed treated with P^{32}, S^{35}, X rays and fast and thermal neutrons. Both these varieties possess the dominant epistatic gene B_1 on chromosome 5A; the awn mutations behaved as monogenic changes in genetic analyses. The mutants had $2n = 42$ and no prominent alteration in their caryotypes could be detected. In trials of 25 awned mutants of NP799 and 6 of NP809, all the mutants of the first variety outyielded the parent variety, while some of those of NP809 were superior in yield to the parent variety and others inferior. Mutants found to be the most promising in the first year of trial maintained their performance in subsequent years. The awned mutants of both varieties are similar to their parents in such characters as maturity period, shape and quality of the grain and rust resistance. The enhanced yielding ability of most of the mutants could therefore be due to the effects of awns. The fully awned condition also has the advantage of conferring resistance to bird damage. NP799–25 has been named NP836 and is to be tested on a larger scale.

4442 GAPONENKOV, T. K.
(Characteristics of a vegetative hybrid of hard wheat).
Agrobiologija (Agrobiology) 1960 : No. 3 : 392–95. [Russian].

A hard spring wheat, obtained by the transfer of an embryo of Melanopus 69 to the endosperm of *Triticum persicum* at the Voronež Agricultural Institute, is described. It exceeds both parents in tillering, number of spikelets and grains per ear, 1000-grain weight and grain yield. It is more vigorous and resistant to diseases and differs from its parental forms in biochemical and physiological properties. In particular its grain is richer in protein and starch and the leaves have higher contents of chlorophyll, nitrogen and sugar. The photosynthetic activity and respiration rate in the hybrid are higher than in the parent varieties.

4443 PEL'CIH, I. L.
(Vegetative hybridization of spring wheat).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 276–86 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G321 : p. 32. [Russian].

An account is given of vegetative hybridization of spring wheats, using wheat, rye, maize or barley as the other component, at the Dokučaev Agricultural Institute. Among the seed progeny of the vegetative hybrids were plants distinguished by good tillering, compact ears, firm straw, earliness and other characters.

4444 MARTYNENKO, M. S.
(Obtaining branched-eared forms of hard spring wheat in vegetative hybridization).
Bjull. nauč.-teh. Inf. nauč.-issled. Inst. saharn. Svekl. (Bull. sci.-tech. Inf. sci.-res. Inst. Sug. Beet) 1958 : No. 6 : 102–05 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G271 : p. 27. [Russian].

Morphological descriptions are given of the F_0, F_1 and F_2 of 104/Arnautka Nemerčanskaja. Some families of the vegetative hybrid produced branched-eared forms in the F_1 and F_2. This character was absent in the parent varieties.

4445 AZATJAN, A. N.
(The results of vegetative hybridization of winter wheat).
Izv. Min. sel'sk. Hoz. Arm. SSR (News Min. Agric. Arm. SSSR) 1960 : No. 4 : 53–59 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3A232 : p. 25. [Russian].

Vegetative hybrids with a high 1000-grain weight and productive ears were obtained in Armenia by transplantation of the embryo of one variety on to the endosperm of another. The embryos were provided by soft wheats pertaining to vars. *turcicum* and *hamadanicum* and the endosperms by *Triticum polonicum* and *T. durum* var. *apulicum*. The hybrids gave many segregates in the first to third generations, and constant forms with economic properties superior to the standard Artašatic 42 were selected in the fourth generation.

4446 TRUHINOVA, A. T.
(An experiment on producing winter wheat from spring by vernalizing the seeds at negative temperature).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 68–71. [Russian].

Seed of three spring wheats and one spring barley was vernalized at different temperatures and sown in spring near Moscow for four successive years. No changes resulted in the first three years but after the fourth year in the progeny of one series of Milturum 321 a few plants belonging to vars. *alborubrum* and *ferrugineum* appeared and in one series of Lutescens 62 one plant eared later than the rest; its progeny contained 60% of winter plants; some awned plants also appeared.

4447 HITRINSKIJ, V. F.
(Directed change of the inheritance of spring crops into winter crops as a breeding method).
Nauč. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 55–82. [Russian].

An account is given of training the spring wheats Lutescens 1163, Odessa 13 and Odessa 16 for winter habit and descriptions are given of a few winter families available at Odessa by 1956. In winter hardiness they approximated the standard Odessa 3. Some were early, resistant to lodging and productive of high-quality grain and were superior to Odessa 13 and Odessa 16 in resistance to *Puccinia triticina* and *Tilletia*.

4448 LAZÁNYI, A.
Contribuţii la problema obţinerii de noi soiuri de grîu de toamnă prin metoda polenizării libere între soiuri. **(Contributions to the problem of obtaining new varieties of winter wheat by the method of intervarietal open pollination).**
Lucrăr. şti. Inst. agron. P. Groza, Cluj 1960 : 16 : 27–33.

Lines showing improvements in yield, grain size and resistance to lodging were obtained by exposing emasculated plants of B51 to pollen from Cenad 117, Odvos 241, A15, Bărăgan 77 and Bánkút 1201, and growing the progenies under conditions of high nutrient supply.

4449 LAZÁNYI, A.
Linii noi de grîu de toamnă. (**New lines of winter wheat**).
Lucrăr. şti. Inst. agron. P. Groza, Cluj 1960 : **16** : 35–39.

As a result of the breeding experiment described above [4448], two new promising lines, L6 and L20, were selected and are here described. They are high yielding, winter hardy and resistant to lodging. L6 has good baking quality.

4450 KARAPETJAN, V. K.
(**Converting slightly winter-hardy winter and spring varieties of hard wheat into hardy winter forms**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 54–67. [Russian].

Several winter varieties of *Triticum durum* from Azerbaijan, all of which proved insufficiently hardy in the Moscow area, and one spring form were sown for a number of successive seasons in the autumn in the vicinity of Moscow. Treatment for two years resulted in a marked reduction in hardiness in several of the winter varieties and in their acquiring the capacity to come into ear when sown in the spring. The progeny from the third year of treatment showed a sudden increase of hardiness, with a survival of 51·4–70·5% in the variety Hordeiforme 1426/7 as against 31·4–31·8% in the untreated material.

The progeny of the spring form *T. durum* 'Palestinka 6' [Palestine wheat 6] subjected to autumn sowing for one or more years became almost as hardy as Kooperatorka, with a survival of up to 74·1% as against 79·5% in Kooperatorka. Some plants in these progenies behaved as winter forms when spring sown and in vernalization experiments they were shown to require 45–50 or more days of cold treatment to induce earing.

The winter plants from treatment of Hordeiforme 1426/7 when subjected to winter conditions without snow cover, where temperatures fell to −17·5° C., had a survival of 42·0–65·3%, whereas the survival for the untreated Hordeiforme 1426/7 was only 1·6%. Those from Palestinka 6 gave a survival of 73·7–91·3 whereas untreated Palestinka 6 was killed completely. After subjection to a temperature of −20° C. there was a survival of 35·1% in treated progenies from Hordeiforme 1426/7 and 3·75% in untreated; progenies of the wheat Sary-Bugda [Yellow wheat] after four years of autumn sowing had a survival of 92·7–100% after subjection to −20° C. compared with 60·0% for the untreated.

The above changes were often accompanied by certain morphological changes such as the appearance of characteristics of *T. aestivum*. The changes came about suddenly, no intermediate forms being observed, and are ascribed to the result of shattered inheritance.

4451 SCHOBER, K.
"Svenno", eine neue Sommerweizen-Sorte. (**Svenno, a new spring wheat variety**).
Landwirtschaft 1961 : No. **3** : 7–8.

This Swedish wheat [cf. XXIV, 194] is being released in Lower Austria as a high-yielding wheat of high quality.

4452 MITKOV, T.
Coltivazione in Bulgaria di frumento Italiano. (**Cultivation of Italian wheat in Bulgaria**).
Progr. agric., Bologna 1961 : **7** : 83–88.

Though Ardito and Mentana have not themselves proved suitable for growing in Bulgaria, several promising hybrids have been produced from Ardito; these include the winter wheats Jubileina II [Jubilee II] and Jubileina III. Tabular data are presented which show that still higher yields are given by San Pastore and some of the new Italian wheats such as Produttore [Yielder], Autonomia and Abbondanza. A yield of 5980 kg. per ha. was obtained from San Pastore in conditions when Jubileina II gave 4100 kg., and under specially favourable conditions San Pastore has given yields up to 6000–7000 kg. per ha. without lodging. In zones affected by frost or by rust (*Puccinia graminis*), the Bulgarian wheats have however done better than the Italian.

4453 SEDOVA, K. A. & ČANOV, T. V.
(**The new winter wheat variety—Gor'kovčanka**).
Trud. gor'k. sel'skohozjajstv. opytn. Stanc. (Trans. Gor'kij agric. res. Sta.) 1959 : 184–86 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G492 : p. 46. [Russian].

Gor'kovčanka [wheat from Gor'kij] outyields Ul'janovka on poor soil in the Noncherozem Belt. It is also superior to it in overwintering ability and resistance to lodging. It has good baking properties.

4454 PUŠKARSKIJ, S. D.
(**The breeder Tat'jana Sergeevna Nikolaeva**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 4 : 63–68. [Russian].

An account is given of the production by

Nikolaeva of the winter wheat Stepnaja 135 [Steppe 135] from natural hybrids of Hostianum 237; it is described as winter hardy, drought resistant and relatively free from lodging and shedding, and has served as one of the parents for a number of later successful hybrids, among them Červonnaja [Red], Voronež 9 and Dokučaevskaja; the methods used in their creation are outlined.

4455 Pisarev, E. & Žilkina, M.
(Krasnozernaja—a new variety of spring wheat).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 11 : 43–46. [Russian].
[Cf. XXVII, 2787].

4456 Kiričenko, F. G. & Šumakova, E. M.
(Methods and results in breeding hard spring wheat).
Naučn. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 137–57. [Russian].

An account of breeding hard wheats at Odessa, together with descriptions of Južanka [Southerner] and Družba [Friendship] which reached advanced trials in 1956, is given. Both varieties were obtained from the cross of Palestinian 6 x Hordeiforme 26200. They are more productive and have larger grain than the standard Melanopus 37, to which they are also superior in resistance to *Ustilago* and *Tilletia.*

4457 Račinski, T.
(The wheat variety 301).
Jubil. Sborn. kompl. selskostop. naučn.-izsled. Inst. Kneža (Jubil. Symp. mixed agric. sci.-res. Inst. Kneža) 1960 : 25–34 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 821 : p. 43. [Bulgarian]. (Mimeographed).

This new Bulgarian variety came from a cross of the line 21 (16 x Noé) with the American line L–2010–A_7–4–1–1. It resembles the high-quality variety 11 and is also outstanding for its high yield.

4458 Aziz, M. A.
Improved varieties of cereals and pulses for the former Punjab.
Agriculture, Pakistan 1960 : **11** : No. 4 : 540–48.

Brief descriptions are given of improved varieties of wheat, maize, barley, rice, *Phaseolus mungo, Ph. radiatus* and chickpea.

4459 Sacco, J. da C.
Identificação das principais variedades de trigo do sul do Brasil. **(Identification of the main wheat varieties of southern Brazil).**
Bol. téc. Inst. agron. Sul 1960 : No. 26 : Pp. 36.

The morphological and agronomic characteristics of 16 wheat varieties are described in detail and a key is provided for their identification.

4460 Walkden Brown, C. & Fitzsimmons, R. W.
Wheat varieties for 1961.
Agric. Gaz. NSW 1961 : **72** : 57–72.

Diseases and other problems of wheat production in New South Wales are discussed, with reference to the varietal situation. Descriptive notes are given on varieties recommended for commercial or trial sowing.

4461 Krasnjuk, A. A.
(The problem of selecting strong wheats for the south-east).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 4 : 15–19. [Russian].

The yield and quality characteristics of a number of strong wheat varieties are discussed. Mention is made of two high-yielding, high-quality spring wheat varieties recently developed at the Agricultural Research Institute for the South-East, Lutescens 758 and Saratov 29. The former is a drought-resistant Kitchener x Lutescens 62 selection, while the latter is a lodging-resistant Albidum 24 x Lutescens 55/11 selection. Other spring-wheat varieties discussed include Saratov 210, Saratovskaja Sil'naja [Saratov Strong], Sarrubra, Erythrospermum 841, Bezenčuk 98 and Albidum 2479. The need for increasing the area sown to winter wheats, such as Lutescens 230, Saratov 9 and Petrovskaja 7, is emphasized.

4462 Luk'janenko, P. P.
(The breeding of high-yielding varieties of strong wheat in the Krasnodar region).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 5 : 32–39. [Russian].

The objectives of wheat breeding are discussed with particular reference to quality factors. Information is provided on the origin, characteristics and performance of Novoukrainka 83 and 84, Bezostaja 1 [Awnless 1] and Bezostaja 4. In extensive yield trials, conducted during

1957–59 in Krasnodar, Stavropol' and other districts, Bezostaja 4 consistently outyielded standard varieties.

Novoukrainka 83 is reported to have a crude-protein content of 15–16%, of which crude gluten, of high physical quality, accounts for over 30%. The gluten in the two Bezostaja varieties is markedly elastic. In a 1958 quality test, Novoukrainka 84 produced flour of lower strength and bread of lower volume than the two Bezostaja varieties.

Mention is made of a new wheat-rye hybrid, No. 18, the parental varieties of which were Skorospelka 3 [Early 3] wheat and Manyčskaja rye.

4463 Nová odrůda jarní pšenice Ruzyňská II. **(A new variety of spring wheat Ruzyně II).**
Za Socialist. Zeměd. 1959 : **9** : p. 1052.

This high-yielding variety is outstanding for its resistance to lodging and is therefore suitable for mechanical harvesting.

4464 HORE, H. L. & SIMS, H. J.
Wheat varieties—recommendations for Victoria.
J. Dep. Agric. Vict. 1961 : **59** : 119–23.

Varieties recommended for Victoria include the new wheat Stockade (Eureka II x Ghurka), the first rust-resistant variety developed by the Victorian Department of Agriculture. It ripens about the same time as Olympic and in general appearance and field characteristics closely resembles Quadrat. It is a medium-strong, semihard wheat, distinctly superior in baking quality to the more commonly grown varieties in the state. Stockade has given its most satisfactory performance in the Wimmera district. Progress in breeding is also outlined. Derivatives of Insignia x (Ghurka x Pusa 4) show promise of combining the yielding capacity of Insignia with appreciably improved quality. The possibility of inducing new types of rust resistance by radiation is being explored.

4465 **New Hessian-fly-resistant wheat.**
Agric. Res., Wash. 1961 : **9** : No. **10** : p. 16.

The red spring wheat Lathrop derived its Hessian-fly resistance from PI94587, an introduction from Portugal. It resembles its other parent, Henry, in heading date, height, intermediate texture of the kernels, resistance to lodging and reactions to powdery mildew and leaf and stem rust. Intended mainly for fodder, it is chiefly adapted in Wisconsin but may prove useful in neighbouring states.

4466 **Lathrop spring wheat resists hessian fly.**
Crops & Soils 1961 : **13** : No. **6** : p. 20.
[Cf. 4465].

4467 CARENKO, JE. G.
(Local forms of winter wheat and their utilization in breeding).
Zborn. nauk. Prac'. nauk.-dosl. Inst. Zemlerobstv. Tvarinnictv. Zahidn. Rajon. Ukrajin. RSR (Symp. sci. Wk. sci.-res. Inst. Agric. Anim. Husband. W. Distr. Ukrain. SSR) 1959 : No. **11** : 3–9 : from Ref. Ž. (Ref. J.) 1961 : No. **2** : Abst. 2G490 : p. 46. [Ukrainian].

A great number of local varieties studied at L'vov were resistant to diseases and better adapted to climatic and soil conditions than recent cultivars. However, their yields were a little below those of the standard varieties. By crossing some local varieties with high-yielding cultivars the new varieties L'vov 8, L'vov 15 and L'vov 38/54 were obtained. They outyield the standard varieties by 3–4 c. per ha. and are resistant to fungi.

4468 DEKAPRELEVICH [DEKAPRELEVIČ], L. L.
Die Art *Triticum macha* Dek. et Men. im Lichte neuester Untersuchungen über die Herkunft der hexaploiden Weizen. **(The species *T. macha* Dek. et Men. in the light of the most recent investigations on the origin of the hexaploid wheats).**
Z. Pflanzenz. 1961 : **45** : 17–30.

The hexaploid *T. macha*, a glumed species with a brittle rachis, cultivated in parts of Georgia, comprises two subspecies, ssp. *tubalicum*, with lax ears, and ssp. *imereticum*, with compact ears. Both subspecies contain several varieties but have the same area of distribution and the same ecological requirements, and they cross readily. The tetraploid species *T. georgicum*, at one time assigned to *T. macha*, differs from it in several morphological and ecological characters, and the fertility of F_1 hybrids of the two species is low. A comparison of *T. macha* with European and Iranian forms of the hexaploid species *T. spelta* reveals, in spite of marked differences, certain similarities among the three wheats in a number of characters. This observation, together with a review of cytological and genetical work on *T. macha* and *T. spelta*, suggests that the three hexaploids either derive from a common ancestor or have arisen independently from similar though not necessarily identical crosses of tetraploid wheat with *Aegilops squarrosa*. The latter hypothesis is favoured, *T. dicoccoides*, *T. chaldicum* and different forms of *Ae. squarrosa* being suggested as the parental forms. It is thought that naked, tough-eared varieties probably arose from crosses between *T. spelta* and *T. macha* where these occurred together [cf. 117]. Georgia, Armenia and Iran are suggested as the probable area of origin of the glumed hexaploid wheats.

4469 LONGWELL, A. C. & SVIHLA, G.
Specific chromosomal control of the nucleolus and of the cytoplasm in wheat.
Exp. Cell. Res. 1960 : **20** : 294–312.

"The effect on nucleolar and cytoplasmic growth of increased and decreased doses of various of the chromosomes of hexaploid wheat was studied. Removal of pairs of strong nucleolar chromosomes or of either arm of nucleolar chromosomes was found to have little or no effect on nucleolar volume, nucleolar dry mass, or cytoplasmic dry mass, or cytoplasmic RNA content. With respect to numbers of nucleoli produced, normally latent nucleolar chromosomes can compensate for almost 100% of the nucleolar activity of a missing pair of strong nucleolar chromosomes. Cells tetrasomic for non-nucleolar chromosomes do not differ significantly from the normal in nucleolar volume, nucleolar dry mass, or cytoplasmic dry mass. On the other hand, cells tetrasomic for the strong nucleolar chromosomes show significant increases (about 50 per cent) in nucleolar volume, nucleolar dry mass, cytoplasmic dry mass, and cytoplasmic RNA content. Cells tetrasomic for the strong nucleolar chromosomes, but missing one pair of non-nucleolar chromosomes, so that the total chromosome number is the same as in normal cells, behave as regular tetrasomics for these nucleolar chromosomes. In the microsporocyte tissue studied, both nucleolar and cytoplasmic protein synthesis and cytoplasmic RNA content is under specific nucleolar chromosomal control. The increase in cytoplasmic mass may result from the increase in nucleolar mass, increase in the products synthesized by the nucleolus, or an increase in general nuclear RNA and protein brought about by the increased dose of nucleolar chromosomes. The increase in cell mass resulting from additional nucleolar chromosomes may have important implications in respect to the mitotic index." [Authors' summary].

4470 BHASKARAN, S. & SWAMINATHAN, M. S.
Metaphase chromosome length and DNA content in relation to polyploidy in *Triticum* species.
Exp. Cell Res. 1960 : **20** : 598–99.

The ratio of total chromosome lengths in *T. monococcum* (2*n*), *T. dicoccum* (4*n*) and *T. aestivum* (6*n*) was shown to be 1 : 1·6 : 2·0, while the ratio of nuclear DNA content was 1 : 1·45 : 1·92. These data indicate that in wheat the DNA content per unit length of chromosome is constant.

4471 RILEY, R.
The diploidisation of polyploid wheat.
Heredity 1960 : **15** : 407–29.

"The absence of one chromosome, number V, greatly modifies the meiotic pairing of haploids and nullisomics of wheat, *Triticum aestivum* ($2n = 6x = 42$). It is concluded that this chromosome carries a genetic structure responsible for the diploid-like meiotic and genetical behaviour of the hexaploid. In the presence of chromosome V the genetically and structurally equivalent chromosomes of the different genomes of wheat do not pair, but this isolation breaks down in its absence.

"Evidence from a series of hybrids with *Secale cereale* shows that no similar modification of pairing occurs in the absence of any of the other 20 chromosomes. In addition results from hybrids between wheat and *Aegilops cylindrica*, deficient either for the complete chromosome V or for its long or short arm separately, indicate that the control is exercised by the long arm alone. Thus the genetic system is very localised and it may be that a single locus is responsible.

"None of the diploid species from which chromosome V may have been derived produces a genetic effect on pairing like that of V. This suggests that the diploidising function of V arose by mutation after the origin of polyploidy in wheat, probably at the tetraploid level. It could have resulted either from mutation on V itself or from an unmasking mutation elsewhere. The mutant would probably have been favoured by selection for the improved fertility and genetic stability to which it led.

"It is suggested the meiotic regulation operates through the modification of pairing attractions during prophase.

"Many polyploids have acquired a purely bivalent-forming meiotic regime, with disomic inheritance, subsequent to the development of polyploidy. It seems likely that this may often have been the outcome of genetical, rather than chromosome-structural, modifications.

"Manipulation of the genetic control of pairing, exercised by chromosome V, may have important consequences for wheat improvement, both in the incorporation of variation from other species, and in the reorganisation of the genetic structure of wheat itself." [Cf. XXX, 3794–95]. [Author's summary].

4472 PAI, R. A. & SWAMINATHAN, M. S.
Differential radiosensitivity among the probable genome donors of bread wheat.
Evolution, NY 1960 : **14** : 427–32.

Radiation sensitivity was compared in *Triticum monococcum*, *Aegilops speltoides* var. *ligustica* and *Ae. squarrosa*, the probable donors of genomes A, B and D respectively of *T. aestivum*. The X-ray doses used were 11,000 r. and 16,000 r., and survival, aberration frequency per unit length of chromosome and the X_2 chlorophyll mutation rate were used as indices of sensitivity. On all of these criteria *Ae. squarrosa* was more sensitive than the other two species. It is suggested that the *Ae. squarrosa* genome may have introduced into *T. aestivum* a physiological state which promotes the incidence of a higher frequency of chromosomal aberrations and viable mutations following treatment with mutagens.

4473 IVANOV, JA. A. & KULIKOV, B. N.
(**The reaction of wheat and barley varieties and cultivars to irradiation with radioactive cobalt**).
Citologija (Cytology) 1960 : **2** : 736–39. [Russian].

Data are provided on the percentage of cells showing chromosome aberrations, at anaphase and telophase, in the rootlets of three wheat and three barley cultivars, seeds of which had been exposed to Co^{60} irradiation at dose rates of 4000, 8000 and 10,000 r. Erythrospermum 841 showed most damage and Narymskaja 1 least damage of the wheat varieties. As regards barley, Nutans 187 was most sensitive and F_3 (Nutans 187 x Nutans 4354) least sensitive.

4474 KONÉTOPSKÝ, A.
The size of guard cells of stomata of a natural polyploid series of the genus *Triticum* L.
Biol. Plant., Praha 1961 : **3** : 115–21.

Observations on twenty varieties representing ten species demonstrated that guard cell length increases with increase in ploidy. *T. timopheevi*, however, differs significantly from the other tetraploids. Within the different ploidy groups, the more highly evolved species have longer guard cells. According to their effect on guard cell length the genomes are arranged in a descending series: A>G>B>D. No correlation was found between number of stomata per mm.² and degree of ploidy.

4475 VALENČIĆ, M., MUŠAC, I. & MATIĆ, I.
Ispitivanje toka dozrijevanja pšenice. (**An investigation on the maturation process in wheat**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 969–79.

Varietal differences in the rate of development in the vegetative growth phase, and in the actual duration of that phase, were observed in a group of six varieties.

4476 AVAKJAN, A. A.
(**Biological nature of alternative crops**).
Agrobiologija (Agrobiology) 1960 : No. **1** : 27–41. [Russian].

Comparative studies in Russia on photoperiodism and vernalization of winter, spring and alternative wheat and barley varieties are surveyed. It is concluded that (1) alternative varieties are special winter forms requiring later sowing than ordinary winter varieties and that (2) they acquire the spring habit after being sown as spring crops for several generations. Hybrids between alternative and winter varieties are plants with a true winter habit.

4477 ORLOV, V. N.
(**Some features of the change of spring wheat into winter wheat under the conditions of Kujbyšev province**).
Agrobiologija (Agrobiology) 1960 : No. **1** : 137–39. [Russian].

The experimental material at Kinel' overwintered the first year under glass, as it was the only means of ensuring the survival of the plants. Later, the spring wheats were sown as winter crops in the field for several generations. The results are winter forms of Lutescens 35, Lutescens 62 and Lutescens 801, all of which approximate to the winter standard Ul'janovka in overwintering capacity while exceeding it in yield.

4478 KOROLEVA, O. D.
(**The degree of winter habit of hard wheats from Dagestan**).
Trud. dagestan. sel'skohozjajstv. Inst. (Res. Dagestan agric. Inst.) 1959 : No. **11** : 109–11 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G493 : p. 47. [Russian].

Ak-Bugda [White wheat], Sary-Bugda [Yellow wheat] and Kara-Bugda [Black wheat] produced little grain and Kara-Kil'čak no grain when they were sown as spring wheats. Kara-Kil'čak is regarded as a winter wheat and the others as semiwinter forms.

4479 GLUHIH, K. A.
(Changing spring wheat into winter wheat).
Agrobiologija (Agrobiology) 1960 : No. 1 : 48–52. [Russian].

Two families characterized by winter habit were selected from the spring wheat Tulun 70 which had been trained for winter habit at Kirov. Both families overwinter better and are more productive than the winter standard Lutescens 116.

4480 LASKIN, V. P.
(Changing spring into winter wheat as a method of producing initial material for breeding winter wheat).
Agrobiologija (Agrobiology) 1960 : No. 2 : 210–19. [Russian].

In further studies at Saratov it was noted that Lutescens 758 and Lutescens 53/12 gave rise to more promising winter forms than other varieties [cf. XXX, 276]. The selected families of the above two varieties were winter hardy and productive of high-quality grain.

4481 FEDOTOV, F. JA.
(Obtaining spring wheat varieties by altering the nature of winter wheat).
Agrobiologija (Agrobiology) 1960 : No. 2 : 220–26. [Russian].

In experiments carried out in Vologda, winter wheats with short light and vernalization stages originating from the Ukraine, Czechoslovakia, Yugoslavia and USA were given vernalization treatments at 0–5° C. for 22 days and then grown as spring varieties for several generations. Most of the material produced some grain differing from the initial variety in the first year, but in the succeeding generations gave rise to other morphological and biological variants, including spring forms belonging to other botanical varieties. Some stable families were selected in the third year, while others continued segregating and the selection of this material is still in progress. The selections so far made include Ferrugineum 1728, Erythrospermum 2123, 1466 and 1941, all of which outyield the spring wheat Diamant [Diamond] and are resistant to loose smut and lodging and moderately so to *Puccinia triticina*. Some of the new varieties are earlier than Diamant and equal this variety in gluten content and surpass it in quality.

4482 FEDOROV, A. K.
(The winter hardiness of second-generation hybrid wheat plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 85–87. [Russian].

F_1 plants, derived from spring x winter and alternative x winter intervarietal crosses, were sown in spring and in autumn. After sowing the seeds in the following autumn, observations were made on the relative winter hardiness of the various groups of F_2 plants. The data showed that F_2 plants derived from autumn-sown F_1 were more winter hardy than those derived from spring-sown F_1 plants. The highest level of winter hardiness was found in the F_2 originating from autumn-sown Lutescens 329 (a winter variety) x Noé (alternative), and the lowest in the F_2 from spring-sown Lutescens 329 x Lutescens 62 (spring).
Similar results were obtained in a study of the frost resistance of autumn-sown F_2 plants, derived from spring-sown and autumn-sown F_1. Differences were noted in the growth habit of the two categories of F_2 plants. Thus F_2 plants derived from spring-sown Lutescens 329 x the spring wheat Moskovka [wheat from Moscow] grew and developed during the late autumn more rapidly than the F_2 obtained from autumn-sown crosses.

4483 GORLAČ, A. A.
(Winter-wheat biotypes differing in the length of the postharvest-maturation period of the grain).
Agrobiologija (Agrobiology) 1960 : No. 3 : 447–52. [Russian].

Long dormancy is positively correlated with retarded growth before the onset of winter at Belaja Cerkov'. This correlation was most noticeable in Belaja Cerkov' 37, Lutescens 59 and other varieties adapted to cultivation in the Ukrainian woody steppe.

4484 BELDEROK, B.
De neiging tot schieten bij Nederlandse tarwerassen. **(The tendency towards sprouting in Netherlands wheat varieties).**
Landbouwvoorlichting 1961 : **18** : 347–54.

Tests of grain samples of the sprouting-resistant wheat Peko, harvested from 10 days before to 40 days after full ripeness and germinated at 18° C. and under optimum conditions of humidity, showed that a period of dormancy occurs which lasts until about ten days after full ripeness and during which relatively few grains are able to germinate and the water requirement is high. Thirty days after full ripeness, 100% germination is reached, and less water is required. The combined results of field and germination tests showed that the three white-grained varieties Staring, Minister and Flamingo have no postharvest dormancy and are thus susceptible to sprouting in the ear. Among red-grained wheats, Koga II, and Carpo were highly susceptible, Carsten's VI susceptible, Leda, Dippe's Triumph and Felix resistant and Mado and Peko highly resistant; the last two attain 100% germination appreciably later than other varieties. High temperatures during the yellow-ripe period tend to shorten the dormancy period.

4485 Ching, T. M. & Foote, W. H.
Post-harvest dormancy in wheat varieties.
Agron. J. 1961 : **53** : 183–86.

Of the ten varieties studied at the Oregon Agricultural Experiment Station, Pullman Selection 9 and Rio possessed a definite postharvest dormancy, Orfed and Pullman Selection 12 slight dormancy and the remainder no dormancy, as indicated by rate of germination and optimum temperature for germination. Dormancy was eliminated after storage for 4 weeks at room temperature, or at 38° C. and 15% relative humidity, but was maintained or acquired when the seed was stored at 3° C. Dormancy was not due to impermeability of the testa or to prevention of gas exchange by a layer of moisture under the pericarp. The presence of water and methanol-soluble growth inhibitors in the dormant seeds was however demonstrated.

4486 Everson, E. H. & Hart, R. B.
Varietal variation for dormancy in mature wheat.
Quart. Bull. Mich. agric. Exp. Sta. 1961 : **43** : 820–29.

Postharvest dormancy periods are given for 16 red and 5 white-seeded varieties. Red-seeded varieties exhibited a wide range of dormancy periods but the white-seeded varieties had low or no dormancy. The problems of breeding for strong dormancy are discussed.

4487 Rajki Cicer, E.
A bibe életkorának hatása a megtermékenyülésre és az utódok néhány alapvető tulajdonságára. **(The effect of the age of the stigma upon fertilization and some fundamental characters of the progeny).**
Növénytermelés 1961 : **10** : 51–58.

Wheat flowers were emasculated at time of heading and then (*a*) open pollinated for 1–15 days and then isolated, (*b*) isolated for 1–15 days, open pollinated for one day and re-isolated or (*c*) isolated for 1–15 days and then permanently exposed to open pollination. Seed set increased with length of interval between heading and pollination, the maximum being reached on the third or fourth day. Seed set from treatment (*b*) was often equal or superior to that from longer exposure to pollination. Average seed weight was inversely proportional to seed set, showing the opposite response to pollination treatments. Within the ear, however, both seed set and seed weight were greatest in the middle region of the ear.

4488 Zusmanovič, T. G.
(Some data on wheat hybridization).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 297–305 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G290 : p. 29. [Russian].

The stigmas of spring wheats were most receptive to pollen on the 3rd–4th day after emasculation and those of winter wheats one day afterwards in experiments at Alma-Ata. The success of hybridization depended on the degree of maturity of the anthers. The use of pollen from the central ear of the pollen parent only is recommended, as the progeny from fertilization with pollen from lateral ears possesses lower vitality, besides giving different segregation ratios.

4489 Medvedeva, G. B.
(The role of supernumerary pollen tubes in changing the inheritance in wheat).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 226–33. [Russian].

After emasculating the ear of the seed parent it was enclosed in a bag with ears of two pollinating parents. From 12 crosses performed in this way, 5 gave an F_1 possessing characters of only one parent, whereas in the other 7, plants appeared which possessed dominant characters from more than one of the pollen parents. Thus the F_1 from Ukrainka contained plants bearing the character of awnlessness from one pollen parent and red grain from the other; those from Albidum 26806 and Moskovka combined red grain from one parent and red ear from the other; that from Moscow 2411 combined red ear from one with pubescent ear from the other; those from Moskovka and Graecum 1125 combined red grain from one and awnlessness from the other; and that from Leucurum 888 combined pubescent ear from one with awnlessness from the other. In several cases the F_1 inherited one dominant character from a given pollen parent but not others, though these other characters sometimes appeared in some of the F_2 plants, in proportions corresponding to a recessive rather than a dominant character. The F_2 from F_1 plants with dominant characters from two pollen parents in some cases segregated for both characters and sometimes only for one.

Several of the F_1 plants that possessed dominant characters from only one pollen parent nevertheless produced F_2 generations that segregated for characters from the other parent. Thus an F_1 plant from Hordeiforme 432 which was awned and smooth eared gave an F_2 in which 18·4% of the plants had pubescent ears, a dominant character of one of the pollen parents, Apiculum 950. As many as 4·5% of the F_2 plants from Affine 895 pollinated by Melanopus 903 + Candicans 75/09 were awnless, though the F_1 plant had been awned.

F_3 generations produced from F_2 plants with recessive characters, the ears of which had not been isolated, also contained plants with dominant characters; the F_4, also from unbagged ears, showed no such dominants and is thought to have regained stability.

4490 Gorin, A. P.
(The dependence of natural hybridization in spring wheat on meteorological conditions).
Izv. timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1961 : No. 2 : 20–25. [Russian].

Studies on the influence of temperature, humidity, cloudiness and wind velocity on natural crossing were conducted during 4–5 seasons between 1940 and 1947 on the varieties Lutescens 62, Caesium 111, Garnet, LC5/13–7 and LC7/19–1. The data indicated that, in the Moscow district, relatively cool humid weather promotes natural crossing in wheat. Environmental influences significantly influence pollen viability, particularly during the period between anther dehiscence and fertilization.

4491 Šulyndin, A. F. & Potapova, A. A.
(The phenomenon of selective fertilization and the viability of interspecific wheat hybrids).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 3 : 50–54. [Russian].

Studies are reported on the fertilization of *Triticum aestivum* and *T. durum* by pollen of the two species applied either (1) in a mixture containing approximately equal portions, or (2) separately, with a fixed interval between each application. The percentage of hybrids arising when *T. durum* was pollinated with the mixture was substantially greater than the percentage occurring when *T. aestivum* was similarly treated. This result, together with information obtained from (2), indicated that pollen of *T. aestivum* was superior to pollen of *T. durum* in effecting fertilization. This superiority was shown to be the result of a more rapid rate of pollen germination in *T. aestivum*. Differences in the pollen effectiveness of three *T. aestivum* varieties were also noted and these, too, were found to be the result of differential rates of pollen germination.

4492 Ukolov, A. A.
(Methods of producing intervarietal hybrids of winter wheat).
Agrobiologija (Agrobiology) 1960 : No. 1 : 139–41. [Russian].

Hybrids from multiparental open pollination of Moscow 2453 and Moskovskaja 2453 Ulučšennaja [Improved Moscow 2453] differed in grain yield, percentage of vitreous grain and the content and elasticity of gluten, depending on the pollination technique employed. The values for grain yield, vitreous grain and gluten were higher for hybrids obtained by growing the emasculated parent in close proximity to the varieties which supplied the pollen than when the pollen parents were dispersed over a larger area.

4493 Kiričenko, F. G.
(Utilizing free intervarietal hybridization in seed production of winter wheat).
Naučn. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 161–72. [Russian].

The experiments on the improvement of productiveness and other economic characteristics of Odessa 3 and other varieties by intervarietal open pollination have been continued [cf. XXVI, 3076]. Mention is made of some hybrid material which has been improved by continuous selection in recent years.

4494 Fesenko, N. V.
(A new method of pollinating wheat).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 68–69. [Russian].

A device is described in which the pollen from 10–20 anthers, sufficient to pollinate a single ear, is placed in a small paper container in an insufflator and blown into a bag containing an emasculated ear.

4495 LAPTEV, JU. P.
(A new method of improving the efficacy of intravarietal open hybridization).
Agrobiologija (Agrobiology) 1960 : No. 2 : 264–65. [Russian].

The wheat Narodnaja [People's] set most grains when glumes on the emasculated plants were left intact and the plants were not bagged till the third or fourth day after the onset of flowering. The experimental plants also had a high 1000-grain weight.

4496 RAJKI CICER, E.
A nemesítésben használt búzafajtát nyitva és zárva virágzása. (**Open and closed flowering in some wheat varieties used in breeding).**
Növénytermelés 1960 : **9** : 309–20.

The percentage of open flowers, i.e. those in which one or more anthers are exserted, was studied in *Triticum aestivum* 'B1201' and 'F481' and in *T. durum* 'Román' [Rumanian] and 'Dagesztani' in the years 1957–59. The proportion reached 100% in some cases, being generally greater in the hard wheats. Within species, intervarietal differences were smaller than interseasonal. F481 showed a reduction under conditions of drought, Román under high precipitation and B1201 under both. Isolation of plants for artificial pollination reduced the percentage in the pollen parents of some varieties in some years, F481 showing the greatest reduction. The proportion of flowers with only one exserted anther increased markedly in isolated pollen parents, particularly when detached ears were used.

Seasonal variation in number of spikelets was greater than intervarietal variation. Normally the frequency of open flowers decreases from the first to the last flower of the spikelets, but under artificial pollination the order may be reversed. Under open pollination all parts of the ear show a similar percentage of open flowers, but under artificial pollination the percentage is greater in the upper part.

4497 HRON, R.
Grannenausbildung und Auslese bei Kreuzungen Bart- x Kolbenweizen. **(Development of awns and selection in bearded x beardless wheat crosses).**
Bodenkultur 1960 : **11** : 253–65.

Counting the number of awns more than 3 mm. long in the flowers of first and second order on the spikelet was a more rapid method of measuring degree of awning than the determination of the mean length of 10 awns, and was more satisfactory than measuring the length of the longest awn. Crosses between the bearded wheat Austro Bánkút and the beardless varieties Heine VII and Dr. Lassers Dickkopf [Dr. Lasser's Squarehead] showed that inheritance was monohybrid and intermediate. Some overlap occurred between the homozygous short-awned class and the heterozygous medium-awned class, the amount of overlap varying from year to year and from cross to cross. By careful selection, elimination of bearded types from a segregating population is however possible.

4498 ALADOVA, L. P. & ALADOVA, M. P.
(Empty grain in soft and hard spring wheats).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 55–59 : from Ref. Ž. (Ref. J.) 1961 : No. **4** : Abst. 4G442 : p. 44. [Russian].

Empty grain in soft wheats of diverse origin was studied at Leningrad and in hard and soft wheats at Omsk. At Leningrad, varieties which had low ratios of empty grain originated from Finland, Norway, China and the northern, eastern and mountainous regions of the USSR; high ratios of empty grain occurred in varieties of southern origin. At Omsk, soft wheats had less empty grain than hard wheats. Among the latter, Mediterranean ecotypes had a low percentage of empty grain and the steppe ecotypes from the Volga basin a high one.

4499 SARIĆ, M. R.
Apsolutna težina zrna pojedinih klasaka u klasu pšenice kao pokazatelj njihove različite fiziološke vrednosti. **(The absolute weight of grains from separate spikelets of a wheat ear as an indication of differences in physiological vigour).**
Savremen. Poljopr., Novi Sad 1960 : **8** : 873–82.

Tabulated data are provided on the weight of grains removed from the inner and outer florets of spikelets of 19 wheat varieties, cultivated at Novi Sad in 1957–58. In the case of Bánkút 1205, details are also given of the weight of grain from the upper, middle and lower sections of the ear.

4500 Tidziev, K. A.
(For increased production of "strong" wheats in the Rostov province).
Zemledelie (Agriculture) 1960 : No. **6** : 20–22. [Russian].

The expansion of the area under Priazov'e and other strong wheats which outyield such varieties as Odessa 3 in the province is urged. Priazov'e was bred at Azov and its strength has recently been further improved at the Zernograd breeding station. Priazovskaja Ulučšennaja [Improved Priazov'e] has now a strength of 180–216 ergs, depending on conditions of cultivation. The corresponding values for the original variety are 143–153 ergs.

4501 Mac Key, J. & Bingefors, S.
Försök till durumodling i Sverige. **(Experiments on *durum* cultivation in Sweden).**
Sverig. Utsädesfören. Tidskr. 1961 : **71** : 152–78.

The results of tests of seven *durum* wheats during 1956–58 are reported. Mindum was the only variety comparable in yield with bread wheats in two out of the three test years, and only RL3206 and RL3207 showed satisfactory lodging resistance. No variety was good in quality. Further breeding would be required for *durum* wheat to be grown successfully in Sweden.

4502 Purtov, P. I.
(Enlarging the area under high-quality wheats in the Altaj).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. **2** : 10–13. [Russian].

Among the varieties recommended for cultivation are Wheat-*Agropyron* Hybrids 56, 172 and 173, all of which proved drought resistant and productive of high-quality grain in Kazah trials. Hybrid 56 was earlier than Lutescens 758 and showed resistance to shedding and *Ustilago*.

4503 Jakubciner, M. M.
(The reserves for increased production of hard and strong-floured wheats).
Zemledelie (Agriculture) 1960 : No. **1** : 58–66. [Russian].

Varieties and forms belonging to different ecological groups which have breeding value are described. The most important hard wheats are represented by the Russian steppe group; they are distinguished by environmental adaptability, high protein content and cold resistance. The representatives of other ecological groups include forms valued for earliness, disease resistance, large grain, long ears, firm straw and other useful characters. The strong-floured bread wheats in the Soviet Union belong mostly to the steppe group and it appears that many North American and European cultivars have also been derived from this source. Many varieties with good baking properties obtained by hybridization in America, Argentina, Australia, Europe and Morocco are listed.

4504 Miller, H., Whiteside, A. G. O. & Kalbfleisch, W.
A note on the construction of a small-scale dough expansion apparatus for the estimation of wheat quality.
Cereal Chem. 1961 : **38** : 204–05.

Information is given on further improvements in a small-scale dough expansion apparatus, used at the Genetics and Plant Breeding Research Institute, Ottawa, for testing 5 g. samples of flour [cf. XXV, 926].

4505 Nikolaev, B. A.
(Determining grain quality by the properties of elasticity, resilience and tenacity of the dough).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. **1** : 51–56. [Russian].

Results given by apparatus such as the farinograph and alveograph are considered to be empirical and only approximate. An apparatus is described which enables the elasticity to be determined by reading a needle on a graduated scale, the movement of the needle being controlled by an inclined plane with a weight upon it, suspended against the specimen of dough to be studied, which is 8–10 g. in weight, 5 mm. in thickness and 4 x 4 cm. in area. The dough is prepared with water without the addition of yeast or salt, with a humidity of 44%, being allowed to rise for 1·5 hr. at a temperature of 30° ± 2° C. The determinations are carried out in a thermostat; by removing or altering the weights it is possible to determine both elasticity and resilience.

The results are in good agreement with those from baking tests.

4506 Brej, S.
Wyniki badań nad wartością wypiekową ziarna odmian ozimych i jarych pszenicy ze zbioru 1953–1958 r. **(Results of studies on the baking quality of the grain of winter and spring varieties of wheat from the harvests of 1953–58).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 1–51.

Tests of quality have been performed on 35 winter and 16 spring wheats grown in Poland. The methods used included laboratory baking and determinations of dough characters and protein content of the flour and grain. The results obtained showed a good correlation with those of full-scale baking tests. The water absorption of the flour proved a valuable character for distinguishing between varieties. A correlation coefficient of $r = +0{\cdot}97$ was found between the protein contents of grain and flour, and good correlations were also found between water absorption of the flour and protein content of grain, indicating that the last-mentioned character may be useful in assessing baking quality.

Among the winter varieties, which showed a greater variance than the spring wheats, the best varieties were found in the ecological group proles *hungaricum*, while proles *hydrophilum* contained varieties of low quality and proles *silvaticum* those of intermediate quality.

Varieties of the same origin often did not differ in water absorption.

4507 SUNDAHL, A.-M.
Inverkan av arv och miljö på vetets proteinhalt och bakningsvärde. (**The effect of heredity and environment upon protein content and baking quality of wheat).**
Sverig. Utsädesfören. Tidskr. 1961 : **71** : 137–51.

Studies of (*a*) annual data on crop quality in Sweden since 1935 and (*b*) the results of varietal trials at Svalöf since 1931 show that, although the relation between protein content of the grain and bread volume varies widely with year and locality, linear regression lines may be obtained both for spring and winter wheat data combined and for winter wheats alone; the data for spring wheats alone are more closely approximated by a second degree curve with the higher protein values giving relatively larger bread volumes. It also appears that, for equal protein contents, spring wheat regularly gives a larger bread volume than winter wheat.

4508 WRIGHT, G. M.
Vitreous grain in wheat and the relation of sedimentation and baking scores.
NZ J. agric. Res. 1960 : **3** : 853–60.

Correlations between sedimentation score, baking-quality score, vitreousness, total nitrogen and yield were found to vary with variety in the three varieties studied.

4509 JANKOWSKI, S.
Zawartość cukrów w ziarnie kilku odmian pszenicy. (**Sugar content in the grain of some wheat varieties).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 611–16.

The content of reducing and nonreducing sugars was estimated chromatographically in six varieties of spring wheat belonging to *Triticum aestivum* and *T. durum* grown in different parts of Poland. Differences due to locality were greater than those due to variety and significant differences between varieties were observed only in respect of total sugars, glucose and fructose, the differences for sucrose and maltose not being significant.

4510 PETROV, M. P. & BAHTEEV, F. H.
(**Cereals of the oases of the Nanshan foothills).**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. 1 : 147–53. [Russian].

Details are given of many botanical varieties of *Triticum aestivum*, *T. compactum* and *Hordeum vulgare* from a collection made in the above region of Central China in 1958. *T. aestivum* includes new squarehead forms belonging to vars. *albidum*, *erythrospermum* and *ferrugineum* and a new variety designated *cinereo-inflatum*. The barleys are represented by many naked forms. The rich finds confirm Vavilov's view that Eastern and Central China are a secondary centre of origin of wheats and barleys. Reference is made to the breeding value of wheats and barleys from China and in this connexion varieties bred from local Chinese material are listed.

4511 BOROJEVIĆ, S. & BOROJEVIĆ, K.
Uticaj ruba na genetski potencijal za prinos kod pšenice. (**Genetic capacity for yield in wheat in relation to the border effect).**
Savremen. Poljopr., Novi Sad 1961 : **9** : 391–401.

Data are provided on the influence of the number of plants per unit area and of border effects on spike and kernel characteristics of San Pastore, Mara and Leone [Lion].

4512 FAJERSSON, F.
Nitrogen fertilization and wheat quality.
Agri hort. genet., Landskrona 1961 : **19** : 1–195.

From a detailed investigation of the effects of nitrate fertilization on various quality components, yield and different agronomic characters in five wheat varieties, it is concluded that, while keeping protein content as high as possible, breeders should concentrate mainly on selecting for high gluten quality and good adaptation to high nitrogen fertilization in high-yielding hard wheats with desirable agronomic characters. The studies were conducted at the Weibullsholm Plant Breeding Institute, Sweden.

4513 GORLAČ, A. A.
(Breeding winter wheat for resistance to fungous diseases and pests in the forest steppe of the Ukrainian SSR).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 4 : 58–61. [Russian].

Rust-resistant wheats such as Lesostepka 75, which in 1935 exceeded Ukrainka by almost 13% in yield, have gradually lost their resistance and in 1955 Lesostepka 75 yielded 2% less than Ukrainka; it had become susceptible to brown rust though its resistance to yellow rust was unimpaired. Hybrids derived from Lesostepka 75, such as Belaja Cerkov' 37 and Lutescens 59, are also resistant to yellow rust. Lesostepka 75 is also resistant to smut and bunt and has transmitted this resistance to a number of its hybrids. Kievljanka 156 [Kiev wheat 156], a hybrid of Lesostepka 75 x Ukrainka, has a high tillering capacity and is resistant to attack by Hessian fly. Belaja Cerkov' 198, a hybrid from Erythrospermum 15 x Kawvale, combines resistance to brown and yellow rusts, smut, bunt, Hessian fly, drought and cold with high yield and grain quality. The variety is not genetically uniform and by applying intravarietal hybridization in seed production its heterotic properties and its complex resistance have been maintained.

4514 BOROGEVIĆ, S.
Prezimljavanje italijanskih sorti pšenice 1959/60 godine u Vojvodini. **(Overwintering of Italian wheat varieties in Vojvodina in 1959–60).**
Savremen. Poljopr., Novi Sad 1960 : **8** : 471–84.

San Pastore withstood severe winter conditions in Yugoslavia better than all other varieties tested. Bánkút 1205, Étoile de Choisy, Produttore [Yielder] and Autonomia also showed a high level of winter hardiness.

4515 POTOČANAC, J. & MILADINOVIĆ, N.
Istraživanja ozimosti i otpornosti prema niskim temperaturama talijanskih sorti pšenice. **(Investigations on the winter hardiness and resistance to low temperatures of Italian varieties of wheat).**
Savremen. Poljopr., Novi Sad 1960 : **8** : 859–72.

The Italian varieties tested were in general more susceptible to frost than the Yugoslavian varieties and showed marked differences in frost resistance; some were found suitable for cultivation in parts of Yugoslavia.

4516 RUSZKOWSKI, M.
Badania nad otrzymaniem pszenicy twardej ozimej. **(Experiments on producing a winter form of hard wheat).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 631–33.

A series of varieties of *Triticum durum* were sown in the autumn over a succession of years, but none of them were converted into winter forms. However, with a Russian wheat, *T. durum* var. *hordeiforme*, which delayed earing when spring sown, sowings were made on 25 September in a number of successive years and in this way a form was produced which had a survival of 65–70% in winter conditions where the survival of the winter wheat Dańkowska Graniatka was 70–75%.

4517 SEKULA, J.
Laboratoryjna ocena mrozoodporności pszenicy ozimej. **(Laboratory determination of frost resistance of winter wheat).**
Rolnictwo, Wrocław 1960 : **10** : No. 29 : 77–85.

Seedlings of 12 varieties of *Triticum aestivum* were subjected to a period of hardening, after which refractometric determinations were made of the dry-matter content of the leaves and stems. On the basis of the results the varieties are arranged into groups comprising hardy, intermediate and susceptible forms respectively.

4518 ANDREWS, J. E. & ROBERTS, D. W. A.
Association between ascorbic acid concentration and cold hardening in young winter wheat seedlings.
Canad. J. Bot. 1961 : **39** : 503–12.

The relative ascorbic acid content of the shoots of six varieties grown for 6 weeks at 1·5° C. corresponded well with their known cold hardiness. In ranking varieties for hardiness by ascorbic acid content, the analyses should however be made at comparable shoot lengths.

4519 Pauli, A. W., Kolp, B. J. & Stickler, F. C.
Relationship of cold-hardiness to soluble-protein-nitrogen content and epicotyl growth rates in winter wheat.
Crop Sci. 1961 : **1** : 137–38.

Twenty winter-wheat lines, including eight Cheyenne selections, were frozen for a 24 hr. period at Manhattan, Kans. Highly significant positive correlations were obtained between the percentage of plants surviving this treatment and their soluble protein nitrogen (SPN) content. Several important inconsistencies were noted however and it is thought that SPN content cannot reliably serve as an indicator of cold hardiness. There were no significant correlations between percentage survival and epicotyl growth in d-mannitol solutions of 0, 7 and 11 atmospheres osmotic pressure. The data indicated that osmotic pressure may be more closely related to plant vigour than to cold hardiness [cf. XXX, 1260].

4520 Pavličić, J.
Ispitivanje stepena ozimosti domaćih i stranih sorata pšenice u prolećnoj setvi bez jarovizacije. **(A study of the degree of cold resistance of domestic and foreign wheat varieties sown in spring without vernalization).**
Arh. poljopr. Nauk. 1960 : **13** : No. 42 : 78–91.

The winter hardiness of 42 foreign and 10 Yugoslav varieties was determined in trials at the Plant Research Institute, Belgrade, during 1957–59; techniques described by Feekes and by Schmalz [cf. XXIX, 1429] were employed. On the basis of the data, 35 varieties are classified as winter hardy. This group included hydrophilic varieties from north and northwest Europe and xerophilic Russian varieties as well as varieties from North America, Eastern Europe, Japan and Algeria. Seven varieties classified as moderately winter hardy originated in Italy, Portugal and Rumania. The third group consisted of 10 slightly winter-hardy lines from various countries, including Australia, India, Greece and Japan.

4521 Słaboński, A. & Lipińska, D.
Badania nad odpornością odmian pszenicy jarej na suszę. **(Studies on the resistance of spring wheat varieties to drought).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 669–88.

Conditions of drought were applied at different stages of growth in nine Polish varieties, six different treatments being tested. Time of heading was the stage most susceptible to drought. Sztywna Gorzowska [Gorzów Stiff] was the most widely adapted to different moisture conditions and gave the highest yields in all experiments. Ostka Kleszczewska was next best.

4522 Udačin, R. A.
(The drought resistance of wheats from Central Asia, Afghanistan and Hindustan).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 42–51 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G488 : p. 46. [Russian].

Many wheats belonging to different ecotypes were tested for drought resistance at the Central Asiatic Research Station of the Institute of Plant Industry. The yield of grain from 1m.^{2} was taken as an indication of the degree of resistance.

4523 Wąs, L.
Badania nad sztywnością słomy różnych gatunków pszenic. **(Investigations on straw stiffness in different wheat species).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 689–712.

In this study of 12 winter wheats pertaining to *Triticum durum*, *T. turgidum* var. *linneanum*, *T. aestivum* sspp. *vulgare*, *compactum* and *spelta*, *T. timopheevi* var. *typicum*, *T. dicoccum* and *Triticale*, the results of (1) the Grafius and Brown method of determining straw stiffness [cf. XXV, 242], (2*a*) the *s* and (2*b*) the s^1 method of Ruebenbauer and Riegerowa [cf. XXVII, 1618] and (3) the anatomical method of Michalik-Skucińska and Miszke [cf. XXX, 2531] were compared with the degree of lodging in 1959 and the mean lodging for 1957–59. Method (1) was most closely correlated with lodging, followed by (2*b*). Useful correlations were also obtained between lodging on the one hand and mean straw thickness, ratio of thickness of the sclerenchyma layer to total straw wall thickness, number of parenchyma islets per mm. of sclerenchyma and mean thickness of the straw wall on the other, the last three measurements being made on the second internode from the top.

4524 Merkys, A. & Prialgauskaitė, L. L.
(A study of the connexion between respiration of wheats and their differences in resistance to lodging).
Lietuvos TSR Mokslų Akad. Darb. 1960 : **22** : No. 2 : 23–42. [Russian].

In Lithuanian studies the respiration of the resistant varieties Garsas and 461 was inhibited less by CH_2ICOOH than that of the susceptible varieties 760 and Lutescens 062.

4525 Pugsley, A. T.
Additional resistance in *Triticum vulgare* to *Erysiphe graminis tritici*.
Aust. J. biol. Sci. 1961 : **14** : 70–75.

Earlier work, using races P and P–1 of mildew, led to the identification of five genes for resistance [XXIV, 1020, and XXV, 1886]. A new race (T) occurred in 1960, able to attack varieties carrying only Ml_t, originally discovered in Thul and providing resistance to P and P–1. Four T-resistant wheats, viz. PI92378 from the USSR, PI181374 from Afghanistan, Javelin 325 (fifth back-cross selection, involving Javelin as recurrent parent and Iumillo x *Aegilops squarrosa* as donor) and the Japanese variety Asosan, were studied with respect to their genetical constitution for seedling resistance to races T, P and P–1. The first three carried Ml_u, originally discovered in Ulka and determining resistance to both P and P–1. Asosan possessed a previously unidentified gene, Ml_a, giving resistance to all three races. Ml_s and Ml_b each imparted a moderate degree of resistance to T, in addition to a moderate degree of resistance to the two older races. Chul, with Ml_c for resistance to P–1, was susceptible to the new race. Lines carrying one of the genes Ml_t, Ml_s, Ml_u and Ml_a in a Federation background have been developed for use as testers in the determination of races of the pathogen.

4526 Takegami, S.
(Intervarietal differences in the rate of invasion of wheat spikes by *Gibberella zeae*).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 245–48. [Japanese].

A comparative study of 12 Japanese varieties differing in degree of susceptibility to the above pathogen showed that rate of spread of the fungus from 1–2 initially infected florets was inversely related to degree of resistance.

4527 Alandova, L. P.
(The resistance of hard wheats of different geographical origin to root rot).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 52–55 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G495 : p. 47. [Russian].

Mediterranean wheats and Soviet steppe ecotypes were the most resistant among the hard and soft wheats studied in Siberia, while a variety from Azerbaijan was altogether immune.

4528 Doling, D. A.
Glume blotch in wheat varieties, 1958.
Plant Path. 1961 : **10** : 24–27.

The relative severity of glume blotch [*Septoria* (*Leptosphaeria*) *nodorum*] on 93 varieties during 1958 at the National Institute of Agricultural Botany, Cambridge, England, was determined by eye assessments and a disease-index method. The two methods placed the varieties in similar groups with respect to degree of infection. In a comparison of 19 varieties sown in winter 1957 and also in spring 1958, glume blotch was generally more severe on plants in the spring sowing. In Ardennes-Desprez, Bersée, Bonus, Fleuron and Heurtebise, however, the degrees of infection were relatively low and similar for both sowing dates. Severity of glume blotch was associated with degree of grain shrivelling. The general level of infection of seed was low and bore no relationship to severity of glume blotch.

4529 Bobkova, E. V.
(Methods of increasing the resistance of spring wheat to loose smut).
Trud. gor'k. sel'skohozjajstv. opytn. Stanc. (Trans. Gor'kij agric. res. Sta.) 1959 : 187–91 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G497 : p. 47. [Russian].

The resistance of Lutescens 62 was improved by selection of grain from the central ear of the main stem and by selection of grain for large size and high germination rate.

4530 Ryžej, I. P.
(Breeding wheat for resistance to loose smut).
Agrobiologija (Agrobiology) 1960 : No. 2 : 232–36. [Russian].

The *Ustilago* resistance of some wheat varieties at the Kirgizian agricultural institute was improved by selection of plants with a predominantly closed type of flowering. Such plants have open paleae for only 3–6 minutes and are less prone to infection than those in which the paleae are open for a longer period. The selection was operative in two ways: it shortened the period of open flowering and increased the number of florets with the desired character. Selection of grain formed in non-opening florets completed the work. This grain is distinguishable from that formed in open florets by the remnants of withered anthers found within the glumes. These are absent in the grains from open flowers.

4531 HAR'KOVA, A. P. & SEBTO, A. G.
(Raise the rust resistance of wheat in the littoral area).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 4 : 62–63. [Russian].

A certain number of wheats in the world collection that have proved resistant to *Puccinia graminis*, *P. triticina* and *P. glumarum* when grown in the moist littoral of the Soviet Far East are named. Many that were classed as resistant five or six years ago are now susceptible and continuous efforts by the breeders are required to maintain a supply of resistant varieties.

4532 KOSTIĆ, B.
Increased occurrence of stripe rust in southeastern Yugoslavia in 1960.
Robigo, Castelar 1961 : No. 11 : 1–4; also in Spanish, 4–5.

Data are provided on the response of 53 wheat varieties, growing in the rust nurseries at Pristina and Peć, to natural infection by *Puccinia glumarum* in 1960.

4533 ŠPEHAR, V.
Otpornost talijanskih sorata pšenice prema crnoj žitnoj rđi (*Puccinia graminis* var. *tritici*) na zapadnom području Jugoslavije. [**Resistance of Italian wheat varieties to stem rust (*P. graminis* var. *tritici*) in the western part of Yugoslavia**].
Savremen. Poljopr., Novi Sad 1961 : **9** : 445–54.

Out of 26 Italian varieties tested for resistance to races 21 and 75, only Elia showed some resistance. With the exception of certain Elia and Clavatino biotypes, all the varieties were susceptible to a mixed population of 10 races. However, 15 varieties were resistant to race 14. The North American varieties Regent, Thatcher, Newthatch, Willet, Selkirk and Lee were resistant to races 14, 21 and 75 and, except for Selkirk, were also resistant to the mixed 10-race population.

4534 VALLEGA, J. & CENOZ, H. P.
Comportamiento de variedades de trigo respecto a la roya amarilla (*Puccinia glumarum*) en la República Argentina, observado entre 1944 y 1958 en el valle de El Bolsón (provincia del Río Negro). [**Observations made between 1944 and 1958 in El Bolsón valley (Río Negro province) on the response of wheat varieties to yellow rust (*P. glumarum*) in the Republic of Argentina**].
Rev. Invest. agríc. B. Aires 1961 : **15** : 113–37.

The environmental conditions in El Bolsón valley, an area situated near the Andes at 41° 57′ S., are very favourable for the spread of yellow rust and natural epiphytotics occur almost every year. Out of 1040 *Triticum* lines tested during a 15-year period, 139, including 111 *T. aestivum* varieties, are reported to be highly resistant. Many of these lines are of West European origin; some are closely related and are believed to carry identical genes for resistance. Argentine varieties classified as highly resistant include Benvenuto Sabina, Guatraché Hucal MAG, Magnif MG, Pergamino Gabato MAG, Sureno MAG, Candeal Durumbuck and Massaux Campeón [Massaux Champion].

4535 BAHL, P. N. & KOHLI, S. P.
Inheritance of seedling resistance to race 10 of *Puccinia triticina* Erikss. in *Triticum aestivum* crosses.
Indian J. Genet. 1961 : **21** : 11–14.

In NP770 x Fronteira and La Previsión x NP809, the resistance of the two South American parents depended in each case on three recessive genes.

4536 NAMBISAN, P. N. N. & KOHLI, S. P.
Inheritance of seedling resistance to races 13 and H of *Puccinia glumarum* (Schm.) Erikss. and Henn. in crosses of *Triticum aestivum*.
Indian J. Genet. 1961 : **21** : 15–22.

In investigations at the Wheat Breeding Sub-station, Simla, the resistance of La Previsión to race 13 in a cross with Ridley depended upon a single dominant gene. In Frondosa x NP770, the resistance of the former parent was controlled by a single recessive gene. The resistance of Cometa Klein in a cross with NP770 was governed by two complementary genes, resistance being dominant. In NP770 x La Previsión, the resistance of the latter parent was due to a single dominant gene, whose expression was however inhibited by a dominant epistatic gene for susceptibility, derived from NP770. The resistance of Fronteira to race H in a cross with NP770 was conditioned by duplicate recessive factors, while that of Cometa Klein in a cross with the same susceptible parent was governed by two complementary genes. At least one of the genes for the resistance of Cometa Klein to race 13 differed from those responsible for resistance to race H in this variety.

4537 HAUNOLD, E.
Untersuchungen über das Auftreten physiologischer Rassen des Weizenschwarzrostes (*Puccinia graminis tritici* Erikss. et Henn.) in Österreich im Jahre 1959. [**Investigations on the occurrence of physiological races of wheat black rust (*P. graminis tritici* Erikss. et Henn.) in Austria in the year 1959**].
Z. PflKrankh. 1961 : **68** : 145–54.

In descending order of frequency, races 14, 11 and 21 were the most prevalent races; 13 other races were also found. Race 189 was the most virulent, attacking all differentials, followed by 15 and 11. None of the 19 varieties tested was resistant to race 11 in greenhouse inoculation experiments, but seven were resistant to races 14 and 21.

4538 BASILE, R., LEONORI-OSSICINI, A. & ZITELLI, G.
Razze fisiologiche di *P. graminis* var. *tritici*, identificate in Italia nel 1959. [**Physiological races of black-stem rust of wheat (*P. graminis* var. *tritici*) identified in Italy in 1959**].
Boll. Staz. Pat. veg. Roma 1960 : **18** : 19–22.

Forty races were identified, six of them new for Italy; these include one culture of race 15. Race 34 was still the most common [cf. XXX, 3818], followed by race 21.

4539 BASILE, R., LEONORI-OSSICINI, A. & ZITELLI, G.
Le razze fisiologiche di *Puccinia recondita* Rob. ex Desm. [= *P. rubigo-vera* (DC.) Wint. f. sp. *tritici* (Erikss.) Carl.] identificate durante l'anno 1957. [**The physiological races of *P. recondita* Rob. ex Desm. (= *P. rubigo-vera* [DC.] Wint. f. sp. *tritici* [Erikss.] Carl.) identified during 1957**].
Boll. Staz. Pat. veg. Roma 1960 : **18** : 93–96.
[Cf. XXX, 1450].

4540 OVERLAET, J.
Physiologic races of wheat leaf rust (*Puccinia recondita* Rob. = *Puccinia triticina* Erikss.) occurring in Belgium in 1958.
Robigo, Castelar 1961 : No. 11 : 8–9; also in Spanish, p. 10.

Of 15 races identified, the most prevalent and widely distributed were 11, 14 and 107.

4541 SPEHAR, V.
Preliminary communication about the resistance of Italian wheat sorts to stem rust (*Puccinia graminis tritici*) in the territories of western Yugoslavia.
Robigo, Castelar 1961 : No. 11 : 10–13; also in Spanish, p. 14.

The information contained in this paper has already appeared elsewhere [cf. 4533].

4542 SIKKA, S. M., MAKHIJA, O. P. & RAO, M. V.
Inheritance studies in wheat. XI. Inheritance of seedling reaction to physiologic race 75 and biotype 42B of *Puccinia graminis tritici* Erikss. and Henn. in some intervarietal crosses of *Triticum aestivum* L.
Indian J. agric. Sci. 1961 : **31** : 23–28.

Investigations at the Indian Agricultural Research Institute, New Delhi, indicated that the resistance of NP790 to biotype 42B was monogenically dominant over the susceptibility of Pb. C281, Pb. C591 and NP710. The resistance of its sister selection NP789 was monogenically dominant over the susceptibility of Frondoso. In crosses with Pb. C281, Pb. C591, NP710 and NP775, the resistance of NP790 to race 75 depended upon two duplicate dominant factors. In Rionegro x Pb. C518, the resistance of the former parent was governed by a single recessive gene.

4543 ANDERSON, R. G.
The inheritance of leaf rust resistance in seven varieties of common wheat.
Canad. J. Pl. Sci. 1961 : **41** : 342–59.

Inheritance of seedling resistance to races 1a, 5a, 11, 15a and 126a was studied in Exchange and Selkirk and to races 1a and 15a in Lee, Gabo, Timstein, Mayo 52 and Mayo 54, Thatcher being used as susceptible parent. One gene, Lr_E, determined a type (2) reaction to all five races in Exchange and Selkirk. Another gene, Lr_L, conditioned a type (;1=) reaction to races 1a and 15a in all seven varieties. Isogenic lines of Thatcher and Prelude possessing these genes are being developed. The possible uses of such lines in future work are indicated. The increase in leaf-rust infection of Lee and Selkirk in Canada during 1951–58 is attributed to an increase of races against which Lr_L was ineffective.

4544 BOŠKOVIĆ, M.
Ponašnje nekih italijanskih sorti pšenice prema lisnoj rdji (*Puccinia rubigo-vera tritici* (Erikss. et Henn./Carl.) u uslovima veštačke i prirodne infeckcije u 1958 i 1959 godini. **[The reaction of some Italian wheat varieties to leaf rust (*P. rubigo-vera tritici* Erikss. et Henn./Carl.) under conditions of artificial and natural infection in 1958 and 1959].**
Savremen. Poljopr., Novi Sad 1960 : **8** : 328–39.

The varieties which showed highest resistance were Elia, Leone [Lion] and Razza S6R. Varieties with moderate resistance included Cappelle Desprez, S13, Mara and Produttore [Yielder]. Several scales for estimating the severity of rust infection are described; the modified Gobb scale proved particularly satisfactory and is recommended.

4545 GRUJIČIĆ, G.
Otpornost nekih sorti pšenice prema *Anguina tritici* i razviće parazita. **(The resistance of some wheat varieties to *A. tritici*, and the development of the parasite).**
Arh. poljopr. Nauk. 1960 : **13** : No. 41 : 95–105.

Laboratory and field tests showed that Autonomia and Mara were more resistant to the wheat nematode than four other varieties.

4546 MCNEAL, F. H.
Segregation for stem solidness in a *Triticum aestivum* x *T. durum* wheat cross.
Crop Sci. 1961 : **1** : 111–14.

Hollow-stemmed Rescue x N1315 segregates were crossed with *T. durum* 'Golden Ball' in an attempt to develop a hexaploid line with the stem solidity and sawfly resistance of Golden Ball. Little progress has been achieved thus far. A number of *T. aestivum*-like selections with stem solidity nearly equal to that of Golden Ball were obtained, but they proved to be considerably more susceptible to *Cephus cinctus* than Golden Ball. Their top two internodes were somewhat weaker than in Golden Ball, but it was shown that this fact alone could not be responsible for the difference in sawfly susceptibility. A study of F_2 populations derived from crosses between Rescue (a solid-stemmed variety) and two of the selections indicated that the Golden Ball solidity genes carried by the selections were the same as those present in Rescue. It appears that "the same genes act differently, depending on the genetic background in which they occur."

4547 HOLMES, N. D. & PETERSON, L. K.
Resistance of spring wheats to the wheat stem sawfly, *Cephus cinctus* Nort. (Hymenoptera: Cephidae). I. Resistance to the egg.
Canad. Ent. 1961 : **93** : 250–60.

Studies on the hatching of *C. cinctus* eggs in the stems of resistant (Rescue, S615 and Golden Ball), partially resistant (Stewart) and susceptible (Red Bobs) wheat varieties, and on environmental and structural factors influencing hatching are reported. The results showed that egg mortality was highest in the pith. Varietal differences were noted in the degree of hatching in the pith; fewer eggs hatched in Golden Ball pith than in Rescue pith.

4548 GOŁĘBIOWSKA, Z.
Zagadnienie odporności odmian pszenic jarych i ozimych uprawianych w Polsce na uszkodzenie przez niezmiarkę paskowaną (*Chlorops pumilionis* Bjk.). **[The problem of the resistance of spring and winter wheat varieties cultivated in Poland to damage by the gout fly (*Ch. pumilionis* Bjk.)].**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 545–51.

In tests of 24 spring and 55 winter wheats, conducted at Puławy and nine other Polish

stations during 1951–57, the winter varieties were on the whole less severely attacked than the spring. The least severely attacked were Gorzowska Wczesna [Early Gorzowska], Hela, Ostka Polanowicka [Polanowicka Awned], Podkowianka and Puławska Twarda [Puławy Hard] in the spring wheats and Wysokolitewka Stywnosołma [Stiff-strawed Wysokolitewka], Eka, Ostka Skomorowska [Awned Skomorowska], Ostka Górczańska and Brzostowianka in the winter. The reduction in grain yield was not always proportional to the degree of attack and those that suffered the least loss were Podkowianka, Ruałka, Bajka, Koga and Opolska among the spring and Superelekta and Olza among the winter wheats. The damage to the straw also varied, being least in Nagradowicka, Pomorzanka, Koga and Ostka Chlopicka [Awned Peasant wheat] in the spring and in Superelekta, Dańkowska Jasna [Pale Dańkowska], Kujowianka Więcławicka and Triumf Mikulic in the winter wheats.
Little if any correlation could be established between resistance and morphological features, though varieties with large leaves, particularly when they were broad, were the most severely attacked.

4549 Hashimoto, R. & Hirano, T.
(The period required for completion of vernalization of wheat sown in the open in autumn).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 249–50. [Japanese].

The vernalization requirements of 18 varieties, including both spring and winter forms, were determined.

BUCKWHEAT

4550 Alekseeva, O. S.
(Vegetative hybridization of buckwheat).
Zborn. nauk. Prac'. nauk.-dosl. Inst. Zemlerobstv. Tvarinnictv. Zahidn. Rajon. Ukrajin. RSR (Symp. sci. Wk. sci.-res. Inst. Agric. Anim. Husband. W. Distr. Ukrain. SSR) 1959 : **11** : 61–67 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G322 : p. 32. [Russian].

Vegetative hybrids of buckwheat/*Polygonum divaricatum* were more vigorous and productive of seed than the buckwheat scion and provided a diversity of forms thought to be of interest to plant breeders.

4551 Boratyńska, W.
Zawartość rutyny w tetraploidalnych rodach gryki zwyczajnej (*Fagopyrum sagittatum* Gilib.). **[Rutin content in tetraploid strains of buckwheat (*F. sagittatum* Gilib.)].**
Biul. Inst. Roślin Leczn. 1960 : **6** : 164–68.

From colchicine-induced tetraploid material, developed at the Polish Institute of Applied Botany and Acclimatization, 21 strains were selected on the basis of good morphological characters and long flowering period. Their rutin content ranged from 3·95 to 7·0%, compared with 2·55% in the diploids.

OATS

4552 Moule, C.
L'avoine. **(Oats).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 115–16.

An historical account of oat breeding in France is given, the names and principal characteristics of some of the more important varieties developed during 1918–60 being mentioned. Reference is made to high-yielding, early-maturing selections, recently developed at Versailles, which have shown high resistance to rust and loose smut.

4553 Guerin, P. H.
Breeding new oat varieties for northern New South Wales.
Agric. Gaz. NSW 1961 : **72** : 1–7.

The parent varieties used in oat breeding in New South Wales, and the objectives and present status of the breeding programme, are described.

4554 Martin, W. C.
Inheritance of the fluorescence characteristic in certain cultivated oat varieties.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3954 : p. 1014. (Abst.).

Grain fluorescence was dominant over nonfluorescence in crosses involving the fluorescent varieties Nemaha, Bonda, Jaipur and Missouri 0–205 and nonfluorescent Andrew, Clinton 11 Lot 25 and Fayette. The data suggested that Nemaha and Bonda possess the same dominant gene, and that Missouri 0–205 carries two dominant independent genes, one of which is allelic to that found in Nemaha and Bonda. Both genes were recessive in the three nonfluorescent varieties. Jaipur may carry three independent major factors for fluorescence.

4555 Popović, A. O.
Neke osobine hibrida dobijenih ukrštanjem kulturnog i divljeg ovsa (*Avena sativa* L., var. *cinerea* x *A. sterilis* L., var. *maxima*). [**Some characteristics of hybrids obtained by crossing cultivated and wild oats (*A. sativa* L., var. *cinerea* x *A. sterilis* L., var. *maxima*)**].
Arh. poljopr. Nauk. 1960 : **13** : No. 42 : 35–61.

F$_1$ *A. sativa* x *A. sterilis* hybrids were tall and vigorous and had long panicles. No tendency to grain shedding was observed in any plant. Most spikelets contained three florets, one of which was awned and hairy, while the other two were awnless and hairless. Flower abscission was of the *sterilis* type, i.e. from the bottom upwards. The F$_2$ generation segregated into intermediate, *sativa*-like and *sterilis*-like plants, in the ratio of 9 : 3 : 4. The percentage of 3-grained spikelets in the F$_2$ was 22·9%. Selection for lower hull percentage and for reduced tendency to shedding appears to be possible in the F$_2$. Under favourable conditions, some hybrids produced more green forage than the cultivated parent, indicating the possibility of selecting for silage production. Details are given of the complex segregation observed in the F$_3$ and F$_4$ generations. F$_4$ hybrids showed satisfactory field resistance to *Puccinia graminis* and *P. coronata*.

4556 Wallace, A. T. & Luke, H. H.
Induced mutation rates with gamma rays at a specific locus in oats.
Crop Sci. 1961 : **1** : 93–96.

Seeds of Victorgrain, a variety susceptible to *Helminthosporium* (*Cochliobolus*) *victoriae*, were subjected to Co^{60} γ irradiation and then grown to maturity. After treating germinating X$_2$ seeds with *H. victoriae* toxin, selection of resistant seedlings was carried out. It was assumed that these resistant seedlings represent induced mutations at the locus controlling susceptibility in Victorgrain. "When the seeds at 10% moisture were irradiated at 0, 9, 18, 27, and 36 kr at an intensity of 4·5 kr per minute, the induced mutation rates were 0, 10·4, 13·6, 0·9, and 5·1 x 10^{-8} per roentgen per locus [r/l], respectively. When the seed moisture was 33%, obtained by hydration at 2° C, and irradiation was applied at 0, 4·5, 9 and 13·5 kr at an intensity of 4·5 kr per minute, the induced mutation rates were 0, 35·9, 10·9, and 1·5 x 10^{-8}/r/l, respectively. When the seeds with moisture of 10% were given doses of 17 kr and 25 kr at low intensities, the induced mutation rates were 8·8 and 4·6 x 10^{-8}/r/l, respectively." These induced-mutation rates, which are of the same order of magnitude as those reported for mice and *Drosophila*, were thus influenced by the seed moisture content at irradiation. This observation and the nonlinearity between dosage and mutation rate are discussed.

4557 Krull, C. F. & Frey, K. J.
Genetic variability in oats following hybridization and irradiation.
Crop Sci. 1961 : **1** : 141–46.

Studies at Ames, Ia., on the effects of a strong dose of thermal-neutron irradiation on the genetic variability of three quantitatively inherited characters, heading date, height and 100-seed weight in Clintland, Beedee and Clintland x Beedee F$_2$ populations are reported. Precautions were taken to minimize the possibilities of natural crossing [cf. XXX, 324]. The data indicated that "radiation increased the variance both between and within families in Clintland, Beedee, and hybrid backgrounds. No consistent positive or negative shifts in skewness values were induced by radiation which suggests that equal numbers of beneficial and detrimental mutations were caused. The increased variance due to radiation showed that lines were shifted from the central portion of the distributions, and consistent positive kurtosis values for all three characters indicated that the extremes of the curves were increased relatively more than the flanks. Both the results from the selection experiment and the heritability percentages indicated that the variability created by radiation was equally as heritable as that due to hybridization."

4558 Johnston, T. D.
Studies on the use of radiation in oat breeding.
Ann. Appl. Biol. 1961 : **49** : 370–73.

The effects of X irradiation of the seed upon quantitative characters were studied at the Welsh Plant Breeding Station, Aberystwyth, using the winter oats S147 and S172. The investigation was continued over five generations. The results reported are mainly those obtained with S147, exposed to doses of 20,000 and 30,000 r. In the X$_2$, ten panicles were taken at random from each row and grown in the X$_3$ as single-panicle progeny rows, families being selected in this generation for showing, in one or more lines, differences from the control, especially in height, earliness of heading and yield. Randomly selected families were also carried forward. The individual lines were grown in the X_4 in a replicated experiment, further selections being made for testing in a replicated X_5 trial, with larger plots. Some significant cases of disparity between the selected lines and untreated S147 in height, heading date or yield were found in the X_5. Significant yield variations were only in the direction of lower yield. Certain lines, however, exhibited a consistent tendency towards higher yield in both the X_4 and X_5. From the combined results with S147 and S172, the following conclusions were reached. (1) Variants for date of heading were readily identifiable at the unreplicated X_3 panicle-row stage. (2) Variants for height could also be identified with a reasonably satisfactory degree of accuracy at that stage. (3) Variants in yield, unless very low in productivity, could not be recognized with any precision in the X_3. Lines selected at this stage for apparent yielding ability did not exceed the range shown by the randomly selected families. Selection based on X_4 results was, however, moderately efficient in that the highest yielding lines at this stage maintained their superiority in the X_5, although not differing significantly from the control. In the light of these results, comments are made on some of the problems and the possible value of the irradiation technique in improving oats.

4559 KARAUL'NYJ-ZVEREV, N. V.
(The effect of the growing conditions of the parental components upon the efficacy of crossing and the productiveness of intervarietal oat hybrids).
Agrobiologija (Agrobiology) 1960 : No. **3** : 379–83. [Russian].

Intervarietal hybrids set more grains and gave more productive progenies when one parent was grown as a winter crop and the other as a spring crop previous to crossing in White Russian experiments. The values obtained for grain sets for each parental combination and each combination of parental pretreatments are tabulated. Data are also provided on the production of tillers and grain and 1000-grain weight of the different categories of hybrids in the F_3. The most satisfactory results in all the above respects were obtained when the seed parent was grown as a winter variety. Families of Pobeda [Victory] ♀ x Zolotoj Dožd' [Golden Rain] ♂, Pobeda ♀ x Orel [Eagle] ♂ and Zolotoj Dožd' ♀ x Orel ♂ which greatly outyield the standard Soviet and have larger grain and a lower husk content have been selected. Another high-yielding family, with a slightly lower husk content than Soviet, was selected from Orel ♀ x Pobeda ♂, where the pollen parent was grown as a winter crop prior to crossing. This hybrid had the same 1000-grain weight as Soviet.

4560 OLTMANN, W.
Die Erhöhung der deutschen Getreideernten durch Züchtung und Sortenwahl, besonders beim Hafer. (II. Teil). **(Increasing German cereal harvests by breeding and varietal selection, with special reference to oats. II).**
Saatgutwirtschaft 1961 : **13** : 106–07.

The oat variety Peragold reported in 1956 to have outyielded standard varieties [cf. XXVII, 1537] has maintained its good performance.

4561 **New spring oat to be increased.**
Agric. Res., Wash. 1961 : **9** : No. **9** : p. 15.
Nodaway, new oat for Missouri growers.
Crops & Soils 1961 : **13** : No. **6** : p. 21.

Developed primarily for Missouri, the early-ripening oat Nodaway is resistant to lodging, highly resistant to smut and rust, moderately resistant to crown rust and susceptible to yellow dwarf. It matures 2–3 days earlier than Clintland and has good milling quality and a higher test weight than any other variety commonly grown in Missouri. Nodaway was developed from a cross of Columbia x Marion with a line from Canada.

4562 SADANAGA, K.
A 63-chromosome Cherokee oat plant.
Crop Sci. 1961 : **1** : p. 228.

Two instances of twin embryos are reported from the Iowa Agricultural and Home Economics Experiment Station; one pair was obtained from Clintland and the other from Cherokee. The Clintland twins were both diploid ($2n = 42$) while those of Cherokee were diploid and triploid respectively. The triploid was the weaker of the Cherokee twins but, after separation and repotting, it grew well and equalled the diploid twin in height at maturity; the leaves and stems were thicker and the stomata larger than in the diploid. The anthers of the triploid did not dehisce completely, but sufficient pollen was shed for self pollination and crossing with Clintland. The pollen grains were of two sizes, 36–44 μ and 51–55 μ, respectively. Fully-stained pollen grains of both sizes constituted 38% and 57% of the total counted on two different dates. Only five normal seeds were obtained from unbagged panicles of the triploid and only a single shrivelled seed was obtained from the cross with Clintland. Chromosome configurations were difficult to establish, but all anaphase I cells had 3–12 univalents. Each univalent divided equationally, the two halves moving to opposite poles. In anaphase II, lagging half univalents were observed which later formed micronuclei. Trisomics derived from the triploid are being studied.

4563 SZEPIENIEC, A.
Badania procesu napełniania ziarna kilku odmian owsa na tle zawartości wody w liściach i łodydze. (**Studies of the grain development process in some oat varieties with respect to the water content of the leaves and stems**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 513–24.

At the Grodkowice Experimental Breeding Station, Poland, determinations of the water content of the leaves, stem and grain of three varieties during the course of development revealed varietal differences in rate of loss of water at the end of the vegetative period and during grain development.

4564 MORDVINKINA, A. I.
(**Fatuoids**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 2 : 61–62. [Russian].

Fatuoids are regarded as less noxious than *Avena fatua* or natural hybrids of *A. fatua* x *A. sativa*, as the fatuoids are apt to shed non-dormant seed. As a result most seed falls in the field, germinates, and the young plants are subsequently eliminated by cultivation in the autumn or by winter frost. In studies of an *A. sativa* collection at the Institute of Plant Industry, fatuoids were found in 28 varieties, including 7 Soviet standards. A revision of the conditions for certification of oat varieties permitting a small percentage of fatuoids as an admixture to the variety is advocated.

4565 TURNER, E. M. C.
An enzymic basis for pathogenic specificity in *Ophiobolus graminis*.
J. exp. Bot. 1961 : **12** : 169–75.

"Avenacin, the glucosidic inhibitor present in oat roots, is acted on by a specific glucosidase produced by *Ophiobolus graminis* var. *avenae*, which destroys biological activity, as does hydrolysis with 0·1 N.HCl. Neither *O. graminis* itself nor any other fungus tested produces this enzyme. It is suggested that the resistance of oats to *O. graminis* and its susceptibility to var. *avenae* depend on an inhibitor-inactivating enzyme complex, and this is compared with the antibiotic-inactivating enzyme complex found in penicillin-producing moulds and resistant penicillinase-producing bacterial strains; such a complex may be concerned in other cases of pathogenic specificity. The way in which a variety of *O. graminis* pathogenic to oats may have arisen is discussed." [Cf. 1790].

[Author's summary].

4566 WELSH, J. N., GREEN, G. J. & MCKENZIE, R. I. H.
New genes for resistance to races of oat stem rust.
Canad. J. Bot. 1961 : **39** : 513–18.

Data from Jostrain x Eagle confirmed that the seedling resistance of the first variety to races 1, 3, 4, 13 and 13A of *Puccinia graminis* var. *avenae* depends on a single gene, *E* [XXIX, 1131]. The seedling resistance of Canuck (Hajira x Jostrain) to races 5, 7 and 8 in a cross with Victory was controlled by a single gene, presumably *B*, whereas resistance to race 11 was conditioned by two genes, presumably *B* and *E*. Tests of F_3 seedlings of Canuck x Cherokee (D69 x Bond) with 11 races provided further proof of the occurrence of *E*. This cross is of additional interest because Cherokee possesses *D* for resistance to races 1, 2, 5, 8, 8A, 10 and 11. *B*, *D* and *E* were responsible for resistance to races 1, 10 and 11. Resistances to races 2 and 8 were controlled by *B* and *D*, to race 4 by *B* and *E*, to 6, 7 and 13 by *B*, to 8A by *D* and to 13A by *E*. In these tests *E* was ineffective in conferring resistance to race 13. Tests of F_3 seedlings from RL524.1 (Hajira x Banner) x Eagle for reactions to 14 races indicated the presence of three genes: *B*, determining resistance to races 1, 2, 3, 4, 6, 7, 8, 10, 11 and 13; a previously unrecorded gene, *F*, controlling resistance to 6A, 7A, 8A and 13A and the remaining ten races; and a modifier necessary for the control of resistance to race 7 by *F*.

E imparts high resistance to some races and a mesothetic reaction to others; *A* [cf. *loc. cit.*] and *B* confer high resistance and *D* and *F* moderate resistance to all races against which they are effective. *A*, *B*, *C* and *D* are dominant but *F* is recessive. Resistance due to *B*, *E* or *F* tends to break down at high temperatures. Such genes may therefore be more useful in breeding oats for cooler regions.

4567 THEIS, T. *ET AL.*
Oat varieties with adult-plant field resistance to race 264 of the crown rust fungus.
Phytopathology 1961 : **51** : 303–05.

With a view to facilitating breeding for resistance to race 264 of *Puccinia coronata* var. *avenae* in North America, 4804 entries, including 3750 from the world collection maintained by the US Department of Agriculture, were screened during 1957 for resistance to this race at Isabela, Puerto Rico, while in the succeeding year, 4700 entries, including a large number of breeding lines, as well as entries showing promise of being resistant in the previous test, were studied in a further trial at the same centre. Spreader rows of the highly susceptible variety Markton were used as source of inoculum. Several lines of tetraploid oats, notably CI 7147, 7171 and 7181, displayed a high degree of resistance in both tests. Some derivatives of crosses between resistant and susceptible lines equalled the resistant parent in resistance. CI 7181, in particular, figured in the parentage of lines with a high degree of resistance and fairly satisfactory agronomic characters. Six lines of *Avena strigosa* and one of *A. abyssinica* were resistant in both tests.

4568 ZIMMER, D. E. & SCHAFER, J. F.
Relation of temperature to reaction type of *Puccinia coronata* on certain oat varieties.
Phytopathology 1961 : **51** : 202–03.

The seedling reactions of Canuck, Clinton 59, Glabrota and Saia, inoculated with one culture each of races 202, 263 and 295 of *P. coronata* var. *avenae*, were determined at constant temperatures of 60°, 70° and 80° F. The reaction types of Glabrota to race 263 were respectively classified as 0, 1 and 3 at 60°, 70° and 80° F. Temperature did not have any significant effect on the reactions of (1) the other three varieties to race 263, 202 or 295, (2) Glabrota to races 202 and 295 and (3) 26 additional varieties and lines to race 263. When Glabrota seedlings infected with race 263 were transferred from 80° to 60° F. after full uredial development, a necrotic area developed around the initial type-3 pustule. Upon the reverse transfer, from 60° to 80° F., a ring of small secondary sporulating uredia appeared on the periphery of the necrotic fleck. The data suggested that (*a*) the variation in the reaction of Glabrota must have been the effect of different temperatures on a specific host-parasite interaction between this variety and the clone of race 263, and (*b*) either at least two distinct genes determine crown-rust resistance in Glabrota, or one gene is present which conditions resistance at low temperature but has a differential effect at high temperature.

RYE

4569 STARZYCKI, S. & BARDEL, Z.
Porównanie odmian żyta chlebowego z żytami pastewnymi. (**A comparison of varieties of bread rye with fodder ryes**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 89–98.

Of fifteen bread varieties tested in Poland during 1955–58, all were higher in grain yield than two fodder varieties, and nine were higher in straw yield and 11 in yield of green matter. Recovery and yield after harvest of green matter were poor and differed little among varieties. Varietal differences in protein content of the leaves were detected, the highest content being found in the fodder variety Krzyca Puławska.

4570 RUEBENBAUER, T. & NOWAK, B.
Perspektywy hodowli poliploidalnego żyta. (**Prospects in breeding polyploid rye**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 493–502.

The crosses *Secale montanum* x *S. cereale* and *S. vavilovii* x *S. cereale* have been effected at the Institute of Plant Breeding and Acclimatization, Poland, with a view to introducing characters into *S. cereale* which may be of value in tetraploids. Colchicine-induced tetraploids of Ludowe and Kazimierskie are superior to the initial varieties in straw diameter and 1000-grain weight but inferior in tiller number and grain weight per plant. Breeding aims include better development of the root system, improved fertility and lower nutrient requirements.

4571 MAHALIN, M. A.
(**Polyploid Vjatka Moskovskaja winter rye**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 7 : 143–46. [Russian].

A description is given of a colchicine-induced polyploid form of Vjatka Moskovskaja [Moscow Vjatka], developed at the main Botanical Garden of the USSR Academy of Sciences. As compared with the normal diploid, the polyploid shows the following characteristics: taller and thicker straw; wider and darker leaves; and larger and less compact ears. Percentage seed set is generally higher than in the diploid, and in some ears may be as high as 80–84%. The grains are large, yellow, smooth and oblong-shaped; in one test the 1000-grain weight varied from 40 to 53 g. as compared with 30–32 g. in the diploid.

4572 PEDERSEN, P. N., JOHANSEN, H. B. & JØRGENSEN, J.
Pollen spreading in diploid and tetraploid rye. I. Importance of pollen quantity and pollen distribution for the percentage of seed setting in the ears.
Årsskr. k. Vet.- o. LandbHøjsk., Kbh. 1961 : 54–67.

From experiments on diploid and tetraploid Petkus rye, it is concluded that the larger percentage of sterile (non-seed-setting) florets that characterizes the tetraploid is not related to its lower pollen production.

4573 PEDERSEN, P. N., JOHANSEN, H. B. & JØRGENSEN, J.
Pollen spreading in diploid and tetraploid rye. II. Distance of pollen spreading and risk of intercrossing.
Årsskr. k. Vet.- o. LandbHøjsk., Kbh. 1961 : 68–86.

Measurements of the distances over which pollen grains of diploid and tetraploid Petkus rye were carried by wind revealed no differences which could be attributed to differences in the size of the grains. [Cf. 4572].

4574 RUEBENBAUER, T.
Possibilities of increasing the number of hybrids in populations of cross-pollinated plants by selection of gametes.
Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1961 : **9** : 25–30.

Differences in pollen viability in rye strains of different genotypes are discussed in relation to the possibility of improving rye varieties by increasing the number of hybrids obtained from a mixed population of two components. It is argued that, when one of a pair of parental components exhibits reduced pollen viability, the number of hybrids among their open-pollinated progeny may be increased by adjusting the proportions of seeds sown in inverse relation to the pollen viability of the components. The proportion of hybrids expected from open pollination in such proportionally adjusted populations was calculated for a range of pollen fertilities in the partially male-sterile component. The results indicate a major increase in the proportion of hybrids when pollen fertility in the partially male-sterile component is less than about 10%. With the aim of selecting plants with pollen of low viability, studies are being undertaken on the use of artificial nutrient media for testing pollen germinability and on the effect of different storage conditions on pollen fertility.

4575 BERBIGIER, A.
La dichogamie chez le seigle. (**Dichogamy in rye**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1960 : **10** : 333–37.

From studies on six varieties it is concluded that dichogamy plays only a minor role in the self sterility of this species. Some self-fertile lines have been obtained at the Plant Breeding Station, Clermont-Ferrand, where these studies were carried out.

4576 PLARRE, W.
Die Verbesserung der Qualität des Roggens durch Züchtung. (**The improvement of the quality of rye by breeding**).
Züchter 1960 : **30** : 343–49.

Progress made in breeding rye with light-coloured grain in the German Democratic Republic is reviewed, mention being made of the promising new variety Hellkorn II [Bright Grain II] and the strain 521_{48} [cf. XXX, 2290]. Ash and protein content was found to be improved in tetraploid rye. At the Hadmersleben institute, strains resistant to sprouting have been bred, sprouting being one of the most frequent causes of low baking quality. However, these strains are still not satisfactory as regards other grain characters and standing capacity.

4577 GĄSIOROWSKI, H.
Laboratoryjny wypiek jako metoda oceny wartości wypiekowej mąki żytniej. (**Laboratory baking as a method of evaluating the baking quality of rye flour**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 573–85.

Tests involving different methods of preparing the dough are described.

4578 Biskupski, A.
Wartość wypiekowa ziarna żyta na tle doświadczeń odmianowych przeprowadzonych w Polsce w latach 1955–1957. **(The baking quality of rye grain according to varietal tests conducted in Poland in the years 1955–57).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 731–56.

Weather had the greatest effect upon most quality characters, locality the next greatest and variety the least.

4579 Starzycki, S. & Bardel, Z.
Żyto pastewne. **(Fodder rye).**
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 137–47. (Mimeographed).

Observations on a number of different types of fodder rye are reported. Selections of the rye Świetojańskie differed from normal cereal rye in having a higher tillering capacity, deeper root system, thin straw of great strength and free from lodging, long, pendent ears, small grain and freedom from shedding.

MAIZE

4580 Martínez, A. & James, C. N.
Maíz. Bibliografía de las publicaciones que se encuentran en la biblioteca del Instituto. **(Maize. A bibliography of the publications available in the library of the Institute).**
Instituto Interamericano de Ciencias Agrícolas, Turrialba, Costa Rica 1960 : **1–2** : Pp. xv + 1130.

Approximately 10,000 maize references (including 573 dealing with cytology and genetics and 1479 with breeding), available in the Orton Memorial Library of the Inter-American Institute of Agricultural Sciences, are listed.

4581 Maršálek, L.
Šlechtění kukuřice v Mad'arské lidové republice. **(Breeding maize in the Hungarian People's Republic).**
Za socialist. Zeměd. 1960 : **10** : 180–83.

A brief account is given of the work being carried out at breeding stations in Hungary.

4582 Kapás, S.
Ergebnisse der mit ausländischen Mais-Hybriden im Jahre 1959 vorgenommenen vergleichenden Untersuchungen. **(Results of comparative studies of foreign maize hybrids carried out in 1959).**
Acta agron., Budapest 1960 : **10** : 455–65.

Details of fresh yield, dry yield, date of flowering, stem strength, grain/cob ratio, and uniformity of ear position on the stem are given for 18 Hungarian and introduced varieties tested at six Hungarian stations.

4583 Belaš, T. I.
(Breeding maize varieties and hybrids for the central Nonchernozem Belt).
Agrobiologija (Agrobiology) 1960 : No. 3 : 335–44. [Russian].

An account of maize breeding at the Moscow breeding station is given and some hybrid populations, intervarietal hybrids and top crosses which are productive of grain and forage in the above region are listed. Top crosses of Voronež 80 with the inbred lines VIR13 [Institute of Plant Industry 13], VIR14, VIR18 and VIR26 show the most promise. The production of inbreds from local material has begun, but most material had low vitality and suffered from attacks by *Oscinella*. Some inbreds resistant to *Oscinella* have been selected. Training maize varieties for cold resistance and tolerance of low temperature at the germination stage is in progress.

4584 Musijko, A. S. & Ključko, P. F.
(Work on maize breeding and seed production).
Naučn. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 115–36. [Russian].

Maize breeding at Odessa is discussed and hybrids earlier and more productive than the double cross VIR 42 [Institute of Plant Industry 42] are mentioned. In 1956, the hybrid Longfellow x Kremnistaja Skorospelaja [Early Flint] had the shortest growth period, 109 days. The production of inbred lines of adapted local varieties has begun.

4585 Ionescu-Şişeşti, V., Jovmir, G., Teodoriu, Al. & Teodoriu, A.
Rezultatele experienţelor cu porumb dublu hibrid în condiţii de irigare pe solul brun-roşcat de pădure. **(Results of experiments with double maize hybrids under irrigated conditions on reddish-brown forest soil).**
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 195–215.

An extensive series of Rumanian, Soviet and American double hybrids was tested under irrigation. Information was obtained on grain and stalk yields, vegetative period and hectolitre and 1000-grain weights.

4586 Săulescu, N., Popa, T. & Rădoi, A.
Contribuţii la metodica experienţelor cu soiuri la porumb. (**Contributions to experimental method with maize varieties**).
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 155–64.

Information is given on the effects of border rows, missing plants and presence of neighbouring plants on individual plant yields in maize varietal trials.

4587 Mazoti, L. B.
Interacción núcleo citoplasmática en la herencia del maíz. (**Nucleo-cytoplasmic interaction in maize inheritance**).
Rev. Fac. Agron. La Plata 1960 : **36** : 63–71.

Highly significant differences were noted in the yielding capacity of the progeny of a series of reciprocal crosses between two Cornell lines, one homozygous and dominant for several characters, the other homozygous and recessive. The origin of the two lines is discussed and it is suggested that heritable cytoplasmic characters are responsible for the yield differences. It appears that these differences are expressed as a result of defective or abnormal cytoplasm being "restored" under genotypic influence [cf. XXIX, 1493].

4588 Mangelsdorf, P. C. & Mangelsdorf, H. P.
Evolution at a single locus in maize.
Science 1961 : **133** : p. 1366. (Abst.).

Six genotypes involving all combinations of alleles *Tu*, tu^h and *tu* were compared in isogenic stocks. The genetic changes through the series from *TuTu* to *tutu* are accompanied by the following effects: (1) the tassel becomes less prominent and wholly staminate; (2) the central spike of the tassel increases in size and the branches decrease in number; (3) the ear increases in size and weight at the expense of the tassel; (4) the rachis is enlarged and the glumes become reduced; and (5) the grains increase in size and number. The weight lost in the tassels is accompanied by a gain in weight of about five times in the ears. The middle position on the stalk apparently confers both mechanical and physiological advantages over the terminal position characteristic of other cereals. In a simulated wild habitat, however, the possible ancestral form of maize, pod corn, bears all of its seeds in the tassel and has a marked selective advantage over cultivated maize.

4589 Bálint, A. & Kovács, G. (Mrs.).
A P^{32} felhalmozódása ön- és idegentermékenyített növényállományban. (**P^{32} utilization in self and cross pollinated plant stands**).
Agrártud. Egy. mezőgazdaságtud. Kar. Közl., Gödöllő 1960 : 289–99.

The degree of radioactivity was determined in 14–18-day old grains from maize plants treated with a P^{32} solution two days after pollination. In nine out of 13 combinations the hybrid grains showed a higher activity than grains produced by selfing [cf. 210]. This difference appeared to be most marked when the pollen parent was of good combining ability. Similar determinations on the leaves of the mother plants after pollination revealed an increase in activity in all plants, the increase being generally higher after crossing than after selfing or intravarietal hybridization.

4590 Gluščenko, J. E. & Tovmasjan, O. V.
(**Charles Darwin and some questions of the fertilization of plants**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 234–45. [Russian].

The views of Darwin, Mičurin, Lysenko and others on the vitalizing effects of cross fertilization are recapitulated with citations.

Two early-maturing maize varieties, Bezenčuk 41 and Belojaroe Pšeno [Bright-white millet] were inbred for seven generations. This led to loss of vigour and often to complete sterility when only self pollen was used. If however pollen of other plants such as hemp or sunflower was added to the self pollen then the depressing effect of inbreeding was reduced. Thus in the I_7 the height was 35·7–38·5% in plants of Bezenčuk 41 produced by addition of hemp pollen and the weight of mature ears was 332–381% greater; the ears also matured sooner. In Belojaroe Pšeno the differences were 83·8% for plant height and 438·6% for weight of ears. Similar increases were obtained by adding sunflower pollen. The selfed progeny of the treated plants, produced without further addition of foreign pollen, also showed improvements in vigour and yield. In all cases the amount of improvement varied markedly with different inbred lines.

Hybrids produced from crossing the inbred lines obtained by the use of foreign pollen were equal and often superior in yield to those produced from inbred lines obtained from self pollen alone.

4591 KOČETKOV, V. S.
(An experiment on arranging hybridization plots on an 8 : 4 scheme).
Kukuruza (Maize) 1960 : No. 4 : 43–44. [Russian].

Experience has shown that arrangements of 8 seed parents : 4 pollen parents are more easy to harvest mechanically than the former arrangement of 4 : 2. Counts of pollen on smeared slides showed it to be adequate to ensure pollination and no significant difference was detected in the number of grains set per ear in the different rows when the hybrid VIR 25 [Institute of Plant Industry 25] was produced in this way.

4592 BOJANOWSKI, J.
Jeszcze o metodach hodowli kukurydzy. **(Once more about breeding maize).**
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 158–64. (Mimeographed).

The author contends that heterosis is only one of many aspects that can make a hybrid desirable from the agricultural point of view. Most of the maize hybrids introduced from the USA have not given promising results in Poland, though it may be possible to use some of the inbred parents for crossing with Polish varieties and lines. The merits and defects of various breeding methods are discussed.

4593 CAUDERON, A.
Le maïs. **(Maize).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 119–25.

A detailed account is given of the maize populations which were formerly widely cultivated in France, and of the North American and French hybrids which are now in general use. Certain double-cross hybrids, derived by crossing American and French single-cross lines, are outstanding, notably the early INRA hybrids 200, 244 and 258 and the semiearly INRA hybrids 321, 353 and 430. Tabulated data are provided on the important agronomic characteristics of these hybrids as well as American hybrids in the same maturity class. The factors taken into account in the breeding programme are discussed briefly.

4594 Milho híbrido—sua importância económica. **(Hybrid maize—its economic importance).**
Agricultura, Lisboa 1960 : No. 7 : 48–54.

Brief reports are given of three addresses given at a meeting held at the Instituto Superior de Agronomia in Portugal. P. da Costa gave an outline of the development of maize growing in Portugal, C. de Menezes outlined the methods of producing hybrid maize in the USA and L. Semedo described the organization of similar work in Portugal. Sixteen double-cross hybrids are now in production in Portugal and some of them have outyielded the hybrids from the USA tested in connexion with the FAO scheme.

4595 KOVALEVIČ, M. D.
(Testing cultivars and hybrids in the Kaliningrad province).
Kukuruza (Maize) 1960 : No. 3 : 48–50. [Russian].

Trials of 39 cultivars and hybrids of maize in the period 1954–58 showed that early varieties such as Pervenec [Firstborn] ripened grain regularly in the Kaliningrad area but gave low yields of green matter and with late varieties the position was reversed. The greatest total yield of nutritive material was obtained from midlate types such as Sterling and VIR 42 [Institute of Plant Industry 42].

4596 MUSIJKO, A. S. & KLJUČKO, P. F.
(New high-yielding maize hybrids).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 4 : 20–24. [Russian].

Three new cold-resistant maize hybrids, all with hard, vitreous kernels, have been developed at the All-Union Institute of Genetics and Breeding. Odessa 23, a Gruševskaja Odesskaja x Slava [Glory] cross, is a high-protein line which matures 5–7 days earlier than VIR 42 [Institute of Plant Industry 42]. In trials in the Odessa region, the new hybrid gave high yields, in some cases higher than VIR 42. Odessa 23 is suitable for cultivation in the Ukrainian steppe areas.

Odessa 17, a Voronež x Slava cross, matures 10–12 days earlier than VIR 42 and 5–8 days earlier than VIR 25. It gave higher yields of grain, and was also higher in crude protein content, than VIR 42, VIR 25 and Bukovina 3 in trials conducted during 1957–59. Odessa 17 is recommended for the Har'kov district.

Odessa 19, a Voronež x VIR 44 hybrid, ripens 7–10 days earlier than VIR 25. In trials held in 1958 and 1959, Odessa 19 frequently outyielded VIR 25 and Bukovina 1, particularly in the Sumy, Kiev and Stalingrad districts.

4597 Andrianova, N. F.
(The production of early maize hybrids for collective farms of L'vov province).
Zborn. nauk. Prac'. nauk.-dosl. Inst. Zemlerobstv. Tvarinnictv. Zahidn. Rajon. Ukrajin. RSR (Symp. sci. Wk. sci.-res. Inst. Agric. Anim. Husband. W. Distr. Ukrain. SSR) 1959 : **11** : 10–16 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G517 : p. 49. [Russian].

Mention is made of two intervarietal hybrids from L'vov which outyielded the standard Bukovina 1, one of them being also 2–3 days earlier.

4598 Kuc, A. L. & Muzyčenko, M. D.
(Choosing parental components for production of high yielding maize hybrids in the plain zone of Dagestan).
Trud. dagestan. selskohozjajstv. Inst. (Res. Dagestan agric. Inst.) 1959 : **11** : 68–69 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G522 : p. 49. [Russian].

The best varieties from the Gorsk, Grozno and Osetian breeding stations were chosen as seed parents for crosses with Mestnaja Kavkazskaja Želtaja Kremnistaja [Local Caucasian Yellow Flint]. The results include hybrids which are superior to both parents in earliness, vigour, yield and resistance to insects and diseases.

4599 Vysokos, G. & Il'in, V.
(Maize hybrids).
Sel'sk. Hozjajstv. Sibir. (Agric. Siber.) 1960 : No. 6 : 22–26 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G516 : p. 49. [Russian].

Descriptions are given of heterotic hybrids from Omsk. Most were obtained by intervarietal hybridization using early Siberian flints as the ♀ plant. The hybrids approximated the seed parent in earliness and exceeded both parents in yield and protein and fat contents.

4600 Leng, E. R. & Ross, G. L.
Performance of commercial corn hybrids in Illinois, 1960.
Bull. Ill. agric. Exp. Sta. 1961 : No. 668 : Pp. 44.

The results of trials of 425 commercial hybrids in ten localities in Illinois are reported.

4601 Leng, E. R., Lambert, R. J., Peasley, M. L., Ross, G. L. & Williams, K. E.
Performance of experimental corn hybrids in Illinois, 1960.
Bull. Ill. agric. Exp. Sta. 1961 : No. 669 : Pp. 33.

A report is given on tests of 205 experimental hybrids, comprising 109 double, 93 three-way and 3 single combinations.

4602 Rawlings, J. O.
Theoretical analyses of double-cross and three-way hybrid populations.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3729 : 1030–31. (Abst.).

"The purposes of this dissertation are to develop the analyses of variance for double-cross hybrids and three-way hybrids and to determine the genetic information available from such analyses. The analyses of variance are presented for the complete set of double-cross hybrids and for the complete set of three-way hybrids from a set of p lines. The p lines are assumed to be a random sample of lines with arbitrary but equal inbreeding derived from a random mating population.

"The sum of squares due to hybrids is partitioned into an orthogonal set of seven sums of squares in both the analysis of double-cross hybrids and the analysis of three-way hybrids. The expectations of the mean squares are derived in terms of covariances between hybrid relatives and in terms of the effects defined in a model of linear effects for each analysis. The functional relationships between the components of variance and the covariances between relatives are established. Genetic expectations for the components of variance are derived in terms of the components of genetic variance from the genetic expectations of the covariances between hybrid relatives.

"The genetic interpretations of the F-tests of the components of variance are presented. Several F-tests are presented in each analysis which provide information relative to various genetic hypotheses, many of which involve only epistatic components of genetic variance. F-tests are available for testing additive genetic variance plus all-additive types of epistasis and for testing dominance variance plus all components of epistatic variance except the all-additive types. Relatively powerful tests are presented for testing dominance variance plus all components of epistatic variance and for testing all components of epistatic variance except the all-additive types in both analyses. Quantitative estimates of additive variance, dominance variance, the three dual-factor epistatic components and the three-factor additive x additive x additive component of epistatic variance are available from either analysis. The estimators for these components of genetic variance are presented for the analysis of double-cross hybrids and the analysis of three-way hybrids and the method of deriving their variances is indicated.

"It is concluded that either the analysis of double-cross hybrids or the analysis of three-way hybrids will provide considerable information concerning gene action concomitant with the evaluation of potential hybrids." [Cf. 1500].

4603 Sokolov, B. P. & Ivahnenko, A. N.
(Something new in breeding maize for the northern regions of the USSR).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. **11** : 17–24. [Russian].

Selection of early-maturing plants from southern cultivars grown in the north has not led to the production of varieties of good yielding ability; nor has the application of techniques such as open intervarietal pollination, as witnessed by a number of varieties issued by the Institute of Genetics of the Academy of Sciences, and various other institutes, all of which are shown to be inferior to imported varieties in yield of green matter and grain. Better results have been obtained from the method proposed by the senior author [cf. XXIX, 3802], which consists in pollinating early-maturing local flints with midearly or midlate dent lines, varieties or hybrids from more southerly districts. Data presented show that hybrids produced in this way often excelled all other forms in new areas for maize growing. Thus the hybrids Dneprovsk 33A and Dneprovsk 98 produced an equivalent of 15·1 and 12·8 c. of protein per ha. under conditions where the late-maturing variety Osetinskij Belyj [Osetia White] gave 6·65 c. Another hybrid, Dneprovsk 129, yielded 500 c. of green matter per ha. where the local standard Voronež 76 gave 320 c.

In further work on producing high-yielding F_1 hybrids use is to be made of inbred lines and of male sterility and the hybrids are being tested collectively by a number of stations located in widely separated areas.

4604 Giesbrecht, J.
Morden 88 (ND203 x WD) (CM7 x CM17), a new hybrid field corn.
Forage Notes, Ottawa 1961 : **7** : No. 1 : p. 31.

The above flint-dent hybrid is considerably earlier in maturity than the other hybrids recommended for Manitoba, as is indicated by the fact that it contains 3·4–7·0% less moisture at harvest. The earlier maturity of Morden 88 should make production of maize for grain feasible in a larger area of Manitoba, as well as making cultivation of this crop less hazardous in cooler years.

4605 Dzjubenko, L. K.
(Fertilization and early phases of development of the embryo and endosperm in maize hybrids).
Ukrajin. bot. Ž. (Ukrain. J. Bot.) 1960 : **17** : No. 2 : 6–24. [Ukrainian].

The period between pollination and fertilization of all experimental plants was the same, but differences were observed in the rate of embryo and endosperm development between the mid-season and the late parent varieties and between their sexual F_1 and the first generation of graft hybrids. The sexual hybrids and the late parent developed more slowly than the graft hybrids and the midseason parent.

4606 Il'in, M. & Zvoskova, N.
(New maize hybrids).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1960 : No. 1 : p. 38. [Russian].

New hybrids more productive than the Soviet double-cross and top-cross standards in the North Caucasus, Povolž'e and the Ukraine were bred at Krasnodar and other Soviet Institutes. The hybrids are of the kind where male sterility is imparted to them by one component and pollen-fertility restored by another. The results of 1959 trials of nine of these hybrids are reported briefly.

4607 Ajba, G. G.
(The rating of self pollinated maize lines for ability for imparting sterility and restoring fertility).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 59–64 : from Ref. Ž. (Ref. J.) 1961 : No. **4** : Abst. 4G463 : p. 46. [Russian].

The Texas type of cytoplasmic male sterility has been transferred from Pioneer 336 to many lines at Sumy. Lines which restore fertility to this material have also been selected.

4608 Zonjić, I.
[**Biological and economic characteristics of the varieties (populations) of white and yellow maize in Serbia**].
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1959 : **7** : No. 283 : Pp. 26. [Serbian].

Details of the content of protein, oil and provitamin A in the grain of dents and flints, mostly heterogeneous populations, are given. Generally the populations with white-coloured grain had a higher protein and sugar content than those with yellow grain; the latter on the other hand were richer in oil and provitamin A. However, all material showed considerable variability and the values could overlap, this being attributed to heterogeneity of the populations. Among 10 high-yielding populations four were distinguished by a high protein content, including two having also a high oil content.

4609 Gukasjan, L. A.
(**A biochemical study of some maize double crosses, grown under the conditions of the Ararat plain**).
Izv. Akad. Nauk Arm. SSR : biol. Nauk. (News Acad. Sci. Arm. SSR : biol. Sci.) 1960 : **13** : No. 2 : 41–51 : from Ref. Ž. (Ref. J.) 1961 : No. **4** : Abst. 4G466 : p. 47. [Russian].

The following high-yielding double crosses had grain richer in starch, protein and oil than VIR 42 [Institute of Plant Industry 42]: (39 x 115) x (155 x 23); (2KŽ368 x V38) x (155 x 23) and (SG22 x 38) x (155 x 23).

4610 Pamfil, C.
Contribuţii la studiul hibrizilor dubli între linii consangvinizate de porumb. (**Contributions to the study of double hybrids between inbred lines of maize**).
Lucrăr. şti. Inst. agron. P. Groza, Cluj 1960 : **16** : 45–62.

Further to some earlier investigations [XXX, 2630–31 and 2635], information is given on the effect of addition of fertilizers on the yield and vegetative period of the F_1–F_3 of some double and intervarietal hybrids.

4611 Varenica, E. T., Mar'jahina, I. Ja., Kapidič, P. H. & Kuperman, T. M.
(**Morphological studies of different ecological types of maize and mixtures of them in the conditions of the Moscow area**).
Kukuruza (Maize) 1960 : No. **3** : 43–48.

The average yield of green matter from northern varieties and hybrids when grown in the non-chernozem zone varies from 400 to 500 c. per ha. One of the best is the hybrid Bukovinskaja 3, which is capable of withstanding brief frosts of —4° C. in the spring and escaping the attack of frit fly on account of its rapid growth; it forms 2–3 ears of almost equal size in favourable years.
When 2–4 seeds belonging to varieties or hybrids of different maturity period were sown together the yield was intermediate between that of the individual varieties, though different combinations gave somewhat different results; the proportion of grain was however greater and this improved the quality of the silage produced.

4612 Berzsenyi-Janosits, L.
Kukoricafajta nemesítése beltenyésztéses módszerrel. (**Breeding maize varieties by the method of inbreeding**).
Magyar. tud. Akad. Agrártud. Oszt. Közl. 1960 : **18** : 31–39.

A Hungarian programme for the production of synthetics is described. Lines selected from the dent maize Fleischmann Mezőhegyes (Fmh) and tested in back crosses are paired to give single-cross hybrids which are then combined to produce synthetic varieties. Several lines at the back-cross stage have outyielded Fmh by 25%.

4613 Vălčinkov, V.
(**Some questions of intervarietal hybridization in maize**).
Nauč. Trud. kompleks. selskostop. nauč.-izsled. Inst. (Sci. Trans. mixed agric. sci.-res. Inst.), Kneža 1960 : **3** : 115–31 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 3 : Abst. 599 : p. 34. [Bulgarian]. (Mimeographed).

Of the 490 crosses studied, 184 gave better yields than the Bulgarian standard Improved Yellow Land maize and of these 22 surpassed the standard by more than 26% in yield of grain. The magnitude of the heterotic effect is thought to depend on the genetical and ecological differences between the parents, the productivity and rate of growth of the parents and the direction of the cross. Better results were often obtained by crossing a variety with a double hybrid than by intercrossing varieties. Čirpan 96, Čirpan 87, Galben [Yellow], Lister-Fister, Improved yellow land maize and some double hybrids are mentioned as parents notable for their heterotic effect.

4614 NAJDENOV, G.
(The results from intervarietal hybridization in maize).
Nauč. Trud. kompleks. selskostop. nauč.-izsled. Inst. (Sci. Trans. mixed agric. sci.-res. Inst.), Kneža 1960 : **3** : 133–57 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. **3** : Abst. 598 : 33–34. [Bulgarian]. (Mimeographed).

Of the 116 hybrids studied at Kneža in Bulgaria, 76·6% were more productive than the standard variety. Crosses between varieties of the same systematic group but from different environments showed a weak heterotic effect. Seven of the varieties yielding 10% more than the standard came from crosses in which one parent was a double-cross hybrid; the hybrids of parents from different systematic groups gave the best results. Yellow Improved Land maize x A–26, Galben [Yellow] x VIR–42 [Institute of Plant Industry 42] and A–26 x Galben proved to be highly productive and suitable for non-irrigated conditions whilst Lister-Fister x Galben is more adapted to soils with a good water supply. Differences in heterosis were noted between reciprocal hybrids of some crosses.

4615 LONNQUIST, J. H. & GARDNER, C. O.
Heterosis in intervarietal crosses in maize and its implication in breeding procedures.
Crop Sci. 1961 : **1** : 179–83.

Twelve open-pollinated parental varieties, their 66 intercross progenies and a check variety, US13, were grown. The parental varieties included Krug and Reid (Nubold strain) and their second cycle synthetic derivatives K_{II}(A) and R_{II} which were obtained by recurrent selection procedures. Compared with the mid-parental and higher-parental yields, average F_1 values of 108·5% and 102·8% respectively were obtained. The highest F_1 yield was obtained from K_{II}(A) x R_{II}; these synthetics also showed high general combining ability with the other varieties. It is concluded that the performance of the derived synthetics confirms the value of recurrent selection for general combining ability in improving maize populations. Where high specific combining ability is detected, as between Golden Republic and Barber Reid (which gave the second highest yielding F_1), the best results would probably be obtained through a reciprocal recurrent selection programme to exploit specific effects.

4616 CHERRY, J. H., HAGEMAN, R. H., RUTGER, J. N. & JONES, J. B.
Acid-soluble nucleotides and ribonucleic acid of different corn inbreds and single-cross hybrids.
Crop Sci. 1961 : **1** : 133–37.

Preliminary studies, designed to elucidate the physiological basis of hybrid vigour in maize, indicated that the RNA and nucleotide content in the embryonic axis (root and shoot) tissues of the heterotic maize hybrid WF9 x M14 was higher than in the parent inbred lines. The rate of RNA synthesis was considerably greater in the hybrid than in either inbred. The RNA content of the scutellum in all three lines decreased with growth, while the nucleotide content increased; in the embryonic axis, both RNA and nucleotides increased with growth. All the reactions described proceeded more rapidly in the hybrid than in either inbred. Ion-exchange chromatography revealed that the ratio of nucleotide diphosphates to nucleotide triphosphates was not constant in the lines studied.

Data are provided on the nucleotide content in three normal and two dwarf hybrids. Nucleotide content was highest in the dwarf R906 x R917 and lowest in WF9 x C103 (normal). The results of these studies appear to support East's hypothesis that hybrid vigour involves the plant as a whole and that reaction speeds are intimately involved [cf. VII, 100].

4617 DUMANOVIĆ, J.
(The effect of heterosis on oil and protein content in the grain of intervarietal and interline maize hybrids).
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1959 : **7** : No. 284 : Pp. 77. [Serbian].

A number of heterotic maize hybrids were obtained from direct and reciprocal crosses between forms differing in (1) protein content and (2) oil content at Belgrade. Contrary to the common view that high yield and high protein content cannot be combined in the same genotype, heterotic hybrids both highly productive of grain and rich in protein have been obtained. Hybrids highly productive of grain and oil have also been produced. In crosses between genotypes differing in protein content the parent with a low content predominated over the other component. The protein content of the hybrids was raised considerably by crossing these to a line rich in protein. The progeny from crosses between parents differing in oil content was mostly intermediate in this respect, but a slight tendency towards dominance of the seed parent was noted. A study of the mode of inheritance of germ size showed that this approached closely that of the inheritance of oil content.

4618 GUTHRIE, W. D. & STRINGFIELD, G. H.
The recovery of genes controlling corn borer resistance in a backcrossing program.
J. econ. Ent. 1961 : **54** : 267–70.

Inbred Oh45, used in producing commercial hybrids, is resistant to corn borer (*Pyrausta nubilalis*), but imparts some undesirable features, such as over-tight husks, short shanks and inadequate pollen production, to its hybrids. As the first step in the elimination of its faults, the inbred was crossed with a donor single hybrid, M14 x CI187–2, highly susceptible to first-brood infestation. The desired characters were fixed by selfing and selection for four generations. By back crossing S_4 cultures with Oh45 and selecting the S_0–S_5 for resistance to first-brood leaf feeding, using artificial infestations, three lines, Oh45A, Oh45B and Oh45C, have been developed, which are equal to Oh45 in borer resistance but improved in pollen production, husk looseness and shank length. One of three lines may be released as a partial replacement of Oh45, or combined and further selected.

4619 SHAVER, D. L.
Cytogenetic studies of tetraploid hybrids of *Euchlaena perennis* and *Zea mays*.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3994 : 1033–34. (Abst.).

Segregation of 11 markers was significantly altered in hybrids between $4x$ maize and $4x$ *E. perennis*, in comparison with the maize controls. Coefficients of preferential segregation ranged from 0·399 to 0·869. Genetic ratios from the $4x$ hybrids indicated a degree of chromosome homology intermediate to that found by genetical analysis for species belonging to five other genera (unspecified). The comparison suggested that the relationship between *Zea* and *Euchlaena* is congeneric. Linkage, as measured by the coefficient of $4x$ linkage, was stronger in the hybrids than in the maize controls for four of the six regions analysed. This result was consistent with cytological observations indicative of a reduction in chiasma frequency in the hybrids. In segment wx–C, crossing over was higher in frequency than in maize, in spite of the fact that no crossing over occurred in the overlapping wx–sh_1 and wx–yg_2 regions. Inheritance of C thus appears to be irregular in the hybrids. The apparent increase in crossing-over frequency in region Y–Pl in the hybrids may be due to the fact that the frequency of chromosome-6 quadrivalents involving partner exchanges is twice the average frequency for the other nine chromosomes. The clone of *E. perennis* used as parent was heterozygous for sh_1 and is probably triplex. The range in $2n$ number in the progeny of a randomly intercrossing population of 92 $4x$ maize plants was similar to that in the progeny of 40-chromosome individuals. The distribution of numbers within the range of 36 to 43 was, however, significantly skewed towards hypoploidy. Chromosome numbers in the hybrids varied from 29 to 44, this range being significantly greater than in either of the maize populations. *E. perennis* had a quadrivalent frequency of 0·499, as against 0·871 in $4x$ maize. Quadrivalents were restricted to two types in *E. perennis*, whereas ten types were recognized in $4x$ maize. "These observations are compatible with a reduction of chiasma frequency to one or less per single chromosome arm in *E. perennis*. The minimal chiasma number, as estimated from quadrivalent configurations, is 3·879 in *E. perennis*, as compared to 4·202 for *Zea*, and 4·045 in the hybrid." Correlated cytological and genetical data from chromosome 6 indicated that its bivalents were in most, and probably all, cases homosynaptic, since random disjunction for chromosome-6 quadrivalents satisfactorily accounted for the observed frequency of recessive y gametes.

4620 KOUL, A. K. & PALIWAL, R. L.
Further studies on B.R.C. teosinte x maize hybrids.
Agra Univ. J. Res. 1961 : **10** : 79–89.

The F_1 from a cross of ♂ sterile maize with BRC teosinte [cf. 422] consisted of both ♂ fertile and ♂ sterile plants. The former category has 50–100% pollen fertility. About two-thirds of the sterile plants bore morphologically normal tassels, having a pollen fertility of less than 10%. The remainder lacked tassels or had only a barren tassel with a few weakly developed spikelets. Both the fertile and sterile categories, however, comprised plants with regular pairing at meiosis I and others with irregularities, such as univalents and heteromorphic pairs. In the sterile individuals, microspores were formed but subsequently degenerated. The development of bulbil-like structures [cf. *loc. cit.*] by the ♂ inflorescences of early-sown maize x BRC teosinte hybrids and the production of secondary inflorescences on the branches of these vegetative propagules are described. When detached and planted in a nutrient solution or in soil, each branch of a propagule developed into an independent plant, producing three kinds of inflorescence: (1) a ♂ flower in the axil of each of the lowest two or three leaves, (2) ♀ inflorescences resembling those of maize x teosinte, produced in the axils of the next two or three leaves, and (3) a terminal inflorescence similar to the ♀ inflorescence of teosinte.

4621 Shank, D. B. & Adams, M. W.
Environmental variability within inbred lines and single crosses of maize.
J. Genet. 1960 : **57** : 119–26.

Ten inbreds and five single cross hybrids between them were grown in five randomized blocks during a two year period. Coefficients of variation were determined on each plot for each of the following characters: plant height, ear-node height, ear weight, length and diameter, and maturity. The hybrids, as a group, had lower coefficients of variation than the homozygous parents for all of the characters measured. Within the hybrids, significant interline differences were found only for ear-node height. The inbred parents however differed significantly among themselves in all characters except ear diameter. In general, the inbreds were more affected by seasonal variation than the hybrids. While the heterozygous lines were better buffered against environmental changes, the wide interline differences in the inbreds suggest that greater buffering capacity is not necessarily a property of heterozygosity *per se*. The evidence is considered to be best explained by the hypothesis of alternative biosynthetic pathways [cf. XXIV, 775]. "These systems are controlled in maize heterozygotes by alternative alleles of a single gene or by non-alleles of two or more loci. In maize homozygotes they are controlled by non-alleles."

4622 Nelson, O. E. (Jun.) & Ohlrogge, A. J.
Effect of heterosis on the response of *compact* strains of maize to population pressures.
Agron. J. 1961 : **53** : 208–09.

Earlier investigations indicated that an inbred homozygous for the mutation *ct* (compact) for the semidwarf condition was superior in resistance to population stress, compared with a genotypically comparable normal inbred, since it gave higher yields at high densities of population [cf. XXVIII, 447]. In further investigations, tests were carried out on "partial" hybrids homozygous for *ct* and showing appreciable but not maximum heterosis. One of the hybrids had as much as 50% of common germ plasm in its parentage, and the remainder only 25%. The first-mentioned hybrid and many of those in the second category retained the favourable response to population pressure first noted in the original *ctct* inbred. Owing to this response, the optimum population density for maximum yield is much greater than is considered optimum for ordinary hybrids. The development of *ctct* hybrids thus offers promise of securing yields above those produced by normal hybrids. It is however stressed that the superior performance of the better compact hybrids is dependent on high soil fertility and adequate moisture.

4623 Bouillenne-Walrand, M.
Concerning the response of dwarf mutants of *Zea maize* to applications of gibberellic acid (b indol-acetic acid—I.A.A.).
Meded. LandbHogesch. Gent 1960 : **25** : 1159–63.

Among different dwarf mutants treated with gibberellin, only those which contained the same amount of IAA as normal plants of the same parentage responded by an increase in IAA content and plant size. Unresponsive plants contained less IAA and also failed to respond to direct treatment with IAA.

4624 Bouillenne-Walrand, M. & Bouillenne, R.
Substances de croissance et chlorophylle. I. Action de la gibbérelline sur les teneurs en chlorophylle de mutants génétiques nains de maïs (Dr. Phinney). II. Action de la gibbérelline et de l'acide β indol-acétique (A.I.A.) sur une variété normale de maïs ("Spancross'). [**Growth substances and chlorophyll. I. Action of gibberellin on the chlorophyll content of genetic dwarf mutants of maize (Dr. Phinney). II. Action of gibberellin and β-indole-acetic acid (I.A.A.) on a normal maize variety ("Spancross")**].
Bull. Soc. Sci. Liège 1960 : **29** : 239–53; Arch. Inst. Bot., Liège 1960–1961 : **27** : 1–15.

The response of dwarf lines to gibberellin treatment was shown to depend on the genetic control of dwarfing. Dwarfs which originated through "5*N* : 1*dl* segregation" responded by growing to normal height, while lines in which the dominant genes *A* and *B* were responsible for dwarfing did not react to gibberellin treatment. The dwarfs had a higher chlorophyll content than the normal lines from which they were derived; it was noted that gibberellin treatment of the 5*N* : 1*dl* segregates substantially decreased chlorophyll content.

4625 Bojakov, M. D.
(Producing maize varieties for Predural'e).
Agrobiologija (Agrobiology) 1960 : No. 2 : 237–42. [Russian].

Training midseason maize varieties for short growth period at Krasnoufimsk is discussed. The methods comprised seed hardening, growing plants under natural photoperiods, harvesting at the milk-ripe stage and post-harvest maturation in the field without detaching the ears from the stems.

4626 **Mass selection of open-pollinated corn is now found to improve grain yields.**
Crops & Soils 1961 : **13** : No. 6 : p. 19.

At Lincoln, Neb., average annual yield increases of approximately 3·9% were obtained as a result of mass selection within the open-pollinated maize variety, Hays Golden. No additional yield increases resulted from the exposure of the seed to thermal-neutron irradiation.

4627 Douglas, A. G., Collier, J. W., El-Ebrashy, M. F. & Rogers, J. S.
An evaluation of three cycles of reciprocal recurrent selection in a corn improvement program.
Crop Sci. 1961 : **1** : 157–61.

At the Brazos River Valley Laboratory, Texas, studies on two open-pollinated varieties, Yellow Surcropper and Ferguson's Yellow Dent, confirmed the effectiveness of reciprocal recurrent selection methods in improving yields while maintaining genetic variability.

4628 Jarčuk, T. A.
(New samples of Bulgarian maize in the VIR world collection).
Kukuruza (Maize) 1960 : No. 5 : 62–63. [Russian].

Details are given of the principal characteristics of 13 Bulgarian introductions in the collection of the Institute of Plant Industry.

4629 Nicholson, G. E.
Chicha maize types and chicha manufacture in Peru.
Econ. Bot. 1960 : **14** : 290–99.

An account is presented of maize types used to make the fermented drink chicha in the northern coastal, Arequipa and Cuzco regions of Peru. Methods of manufacture in the different regions are also described. The quality and quantity of the dried germinated grains, which are ground to obtain the flour for fermentation, are largely dependent on uniformity in germination rate. This uniformity has been secured by careful selection over a long period. It is tentatively suggested that a study of germination rates may serve as an additional tool in classifying maize races and in elucidating their origins and relationships.

4630 Maguire, M. P.
Pachytene pairing failure in corn in two inbred lines and their hybrid.
Genetics 1961 : **46** : 135–42.

The material studied, L289, I205 and their hybrid, comprised part of the genetic background of the *Zea-Tripsacum* back cross examined in an earlier study [cf. 403]. The results indicate that the frequency of pairing failure in the present material is appreciable but not as high as in the *Zea-Tripsacum* material. As in the latter material, intercalary pairing failure was rare compared with terminal pairing failure. The frequency of failure was substantially higher in the satellite arm of chromosome 6 (designated 6S) than in the other chromosomes (designated non 6S). The frequency of failure in non 6S chromosomes was similar in L289 and I205 (2·65% and 2·0% respectively) but lower in the hybrid (0·35%). The frequency of 6S pairing failure was similar in L289 and the hybrid (3·4% and 2·75% respectively) and lower in I205 (0·7%). Wide variation in the frequency of pairing failure occurred among anthers of a single flower, suggesting that environmental influences may be involved.

Referring to the *Zea-Tripsacum* material, it was thought originally that the high frequency of pairing failure observed in the chromosome which was heterozygous for a *Tripsacum* segment might be due to extensive genetic heterozygosity. This idea is considered to be less plausible in view of the present finding that an increase in heterozygosity is accompanied by a decrease in non 6S pairing failure.

4631 LONGLEY, A. E.
Breakage points for four corn translocation series and other corn chromosome aberrations maintained at the California Institute of Technology.
US Dep. Agric. 1961 : ARS 34–16 : Pp. 40.

As the result of a cooperative project set up between the Agricultural Research Service of the US Department of Agriculture and California Institute of Technology 15 years ago, a large number of translocations and other chromosomal rearrangements induced in maize by treating seeds and pollen with ionizing radiations have been isolated and maintained. It is planned that seed stocks of many of the 1003 translocations and 60 inversions will be available to maize geneticists and cytogeneticists. Analysis of the 1003 translocations has led to the following main observations. Breaks resulting in transmissible translocations are not distributed at random among the 10 chromosomes of the complement, the 20 arms or 10μ sections of the arms. This nonrandomness is present regardless of the material treated or source of radiation. The highest concentration of breaks is to be found in the more densely staining regions of the midprophase chromosomes. Arms with uniform staining density over the greater portion of their length are affected similarly by different types of radiation. Arms with disuniformity in staining density show, with different doses of radiation, variation in position and density of the breaks. In a comparison of the effects of (1) seed exposure to 15,000 r. of X rays, (2) seed exposure to the Bikini-bomb explosion and (3) treatment of pollen with 1000 r. of X rays, (3) had the greatest and (2) the least tendency to incite breaks near the centromere in the production of translocations. Treatment (1) resulted in the greatest variability around the mean in break position and in concentration of breaks. "In conclusion, it can be stated that a relationship exists between staining ability of the chromosome threads and the production of translocations. Differences in this relationship result in differences both in the position and in the density of the breaks that are associated with translocations produced in treating a material either with different intensities of ionizing radiation of one type or with similar types of radiation at a uniform intensity." Tables are given indicating the breakage points of all the translocations and inversions.

4632 TARKOWSKI, C.
Wstępne badania nad di- i poliploidalną kukurydzą. (**Preliminary investigations on diploid and polyploid maize).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 117–36.

At Lublin, Poland, studies of tetraploids, triploids and diploids of dent revealed the following differences: in height, $3n>2n>4n$; in stem thickness, $2n>3n>4n$; in leaf number, $4n>2n>3n$; in number of panicle branches and ear number per plant, $2n>3n>4n$; in ear length and number of grains per ear, $2n>4n$; in ear diameter, row number, grain size and embryo size, $4n>2n$; in pollen size, $3n$ and $4n$ both $>2n$; and in pollen size and leaf thickness, $3n>4n>2n$. The $4n$ forms did not differ appreciably from each other in chemical composition of the grain. The polyploids were variable in time of maturity.

4633 MILLER, O. L. (JUN.).
Cytological studies in asynaptic maize.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3531 : 735–36. (Abst.).

In several genetical studies of asynaptic (*as*) maize, cross-over chromatids have been found in a large percentage of functional diploid eggs, although cytological evidence indicated that such gametes arose from megasporocytes with few or no postdiplotene chiasmata. In addition, haploid gametes from *as* plants have shown significant increases in crossing over in two regions when compared with normal sibs. In view of these anomalies, investigations were carried out on the cytological effects of *as*. Confined to microsporogenesis, the analysis was concerned with (1) observing the different types and degrees of meiotic abnormalities in *as* plants, (2) demonstrating, by means of morphological markers, the presence or absence of crossing over prior to univalent formation in *as* plants, and (3) determining the extent and position of early-prophase pairing in plants with varying degrees of asynapsis at metaphase I. (1) Irregularities other than asynapsis included elongated and curved spindles, split spindles, misdivision of univalent and monad centromeres and partial or complete failure of cytocinesis. No restitution following spindle failure was detected in meiosis I or II. At first microspore mitosis, pollen grains with 10, 20 and 40 chromosomes were observed, the last two resulting from nuclear fusion after failure of cytocinesis subsequent to one or both meiotic divisions. The mean number of bivalents at metaphase I ranged from 0 to 9·95 in separate plants. (2) Heterochromatic knobs were incorporated in the heterozygous condition into plants with a low degree of asynapsis. Although genetic data from normal stocks indicate that chiasmata are frequently formed proximally to the knob positions, no equational disjunction of the knobs was detected among chromosomes occurring at diacinesis as univalents or as rod bivalents with chiasmata in the knobless arms. It was concluded that asynaptic chromosomes had not undergone crossing over. (3) Amount of pairing at early prophase was correlated with degree of asynapsis at late prophase. It was thus assumed that segments unpaired at late pachytene had not been previously paired. In plants with a low degree of asynapsis, unpaired segments at pachytene were usually intercalary, and more often in long than in short arms. The centromeres invariably paired and terminal regions usually did so, indicating that both the centromere and terminal segments may be initial points of synapsis. At diacinesis in such plants, rod bivalents of chromosomes marked with knobs occurred more than twice as often with short-arm as with long-arm chiasmata. These observations may account for the previously-reported higher than normal recombination values, since the regions in which crossing over was studied in *as* plants were distal to the centromere and in short arms.

4634 STROMAN, G. N.
A selfing tube for maize.
J. Hered. 1961 : **52** : p. 12.

Use of a brown-paper tube to connect the bag enclosing the tassel with the ear shoot is described. Once the tassel bag and tube are in place, it is unnecessary to inspect the plant until harvest. As the wind blows, the pollen is shaken towards the silks, which are pollinated immediately upon emergence. The method has recently been used successfully at the Institute of Genetics, Lima, Peru. Whether the strips of gummed paper used to secure the tube would be satisfactory in rainy climates is not known.

4635 GLUŠČENKO, I. E. & TOVMASJAN, O. V.
(**Darwin and some problems of fertilization in plants**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. **1** : 39–51. [Russian].

Darwin, Lysenko *et al.* are cited on the depressive effects of selfing on cross-pollinating plants and Mičurinist experiments on reducing these effects in maize inbreds by pollination with a mixture of maize pollen with hemp, sunflower or pumpkin pollen are described. The substance of these experiments has been already reported, but this account gives some additional details [cf. XXX, 3571]. In particular, mention is made of inbred lines of Bezenčuk **41** and Belojaroe Pšeno [Bright White Millet] which were obtained by utilizing hemp and sunflower pollen; they are more early, productive and vigorous than corresponding lines from pure self pollination and are thought to be useful for production of top crosses and double crosses in areas new to maize cultivation.

4636 STEPANOV, K. I.
(**A study of self pollinated lines of maize obtained by supplementary pollination with foreign pollen**).
Trud. 1. nauč. Konf. molod. Učen. Moldav. (Proc. 1st sci. Conf. jun. Sci. Moldav.) 1960 : 199–205 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G331 : p. **33**. [Russian].

The depressive effects of inbreeding in two maize varieties were reduced at Kišinev by adding pollen of *Atriplex, Hibiscus*, pumpkin, sorghum, African millet, rye, wheat or sunflower to obtain the first-generation inbreds. The inbreds produced in this way acquired morphological stability more quickly than inbred lines from pollination with self pollen only.

4637 BOCHNIARZ, J. & BOCHNIARZ, M.
Technika krzyżowego i wsobnego zapylania kukurydzy. (**Technique of cross and self pollination of maize**).
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. **17** : 152–57. (Mimeographed).

The method described involves the use of small bags, 23–25 x 8–10 cm., and large, 40 x 15 cm., the latter being open at both ends. The small bags are placed on the female inflorescences in the usual way. At the time of appearance of the stigmas or 1–1·5 days before, the large bags are applied. After tying one end of the large bag it is placed on the tassel and tied at the base. When pollen begins to be shed the male inflorescence is bent towards the ear by means of a specially prepared wooden apparatus, the upper end of the large bag is untied, the small bag removed and the tassel bent over to the silk, whereupon the top 1–2 cm. of the ear are cut off and the large bag is tied up again over the two inflorescences.

4638 BROOKS, J. S.
Cytoplasmic male-sterile fertility-restoring gametes in varieties of corn in the Oklahoma collection.
Crop Sci. 1961 : **1** : 224–26.

The frequency of pollen-fertility-restoring gametes produced by 70 open-pollinated varieties and selections was estimated during 1954–55 and 1957–59. Variations in seasonal conditions resulted in variations in frequency estimates, the 1955 estimates being consistently higher than those obtained under the hotter, drier conditions of 1954. Different accessions of a single variety were, in most cases, similar in frequency of fertility-restoring gametes. Within a group of related varieties, frequency estimates were generally similar; some lines differed markedly however. A group of unrelated varieties which was mass selected for a number of agronomic characters showed an increase over the unselected controls in frequency of fertility-restoring gametes, although this character was not considered in the selection procedure. An increase in frequency also occurred in some varieties during maintenance and it is suggested that this may be due either to random drift or to the adaptive value of the *Rf* allele (or alleles linked to it) during periods of heat and drought; adaptive value could account for the increased frequency noted in the mass-selected varieties. It is concluded that "while it seems probable that the pollen production observed is due to the presence of an *Rf* allele, the fact that environment can alter the percent of fertile plants indicates a difference in penetrance of the *Rf* allele or of modifying genes."

4639 GOODSELL, S. F.
Male sterility in corn by androgenesis.
Crop Sci. 1961 : **1** : 227–28.

The conversion of male-fertile inbred lines to male-sterile forms by the use of paternal monoploids is described; four cases of conversion were obtained. The method provides relatively pure-breeding lines in two generations. However, it is considered that unless suitable genetic stocks are found which produce a high frequency of paternal monoploids, or, alternatively, some means of artificially initiating androgenesis is discovered, then the practical value of the method will be limited.

4640 GORSLINE, G. W., RAGLAND, J. L. & THOMAS, W. I.
Evidence for inheritance of differential accumulation of calcium, magnesium, and potassium by maize.
Crop Sci. 1961 : **1** : 155–56.

Information is provided on the accumulation of calcium, magnesium and potassium in the ear leaves of maize inbreds and single crosses, grown at two centres in Pennsylvania in 1959. The data indicated that calcium and magnesium accumulation is highly heritable, the genetic control being essentially additive. Potassium accumulation also appears to be highly heritable but the inheritance mechanism is more complicated, involving nonadditive as well as additive gene action.

4641 FEDOROV, P. S. & TRIFONOVA, E. N.
(The characteristics of root development in hybrids).
Kukuruza (Maize) 1960 : No. **1** : 42–43. [Russian].

It is shown that young plants of heterotic maize hybrids have stronger roots than their parents and it is recommended that root characteristics should be used for evaluating breeding material at early stages of selection.

4642 BÁRTFAY, T. (MRS.).
Hazai kukoricafajták fehérjéinek értékelése a triptofán tartalom alapján. **(Evaluation of the proteins of Hungarian maize varieties on the basis of tryptophane content).**
Agrokémia és Talajtan 1961 : **10** : 111–22.

Preliminary studies of eight Hungarian varieties at three localities in 1956 and 1957 indicate that the contents of protein, zein and tryptophane in the kernels vary according to variety, locality and year, varietal differences being greatest.

4643 PUKALOV, B. P.
(The breeding of maize for improvement in protein content in conditions of the Moldavian SSR).
Trud. 1. nauč. Konf. molod. Učen. Moldav. (Proc. 1st sci. Conf. jun. Sci. Moldav.) 1960 : 207–14 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G462 : p. 46. [Russian].

The protein content of two local varieties has been greatly improved by selection at Kišinev.

4644 Crumpacker, D. W.
Colorado's open-pollinated corn varieties.
Colo. Fm. Home Res. 1961 : **11** : No. 5 : 3–6.

A collection has been made of open-pollinated varieties still available in Colorado. The considerable variability shown by the collection reflects the various origins of the maize grown in the state, the diversity of climatic and soil conditions under which the varieties have been cultivated and the different types of artificial selection practised by local farmers. In breeding maize for Colorado, the open-pollinated varieties will provide a source of locally adapted inbreds for inclusion in conventional four-way hybrids for the irrigated areas, and they may also be directly useful as parents in intervarietal hybrids or top crosses for the nonirrigated areas in the eastern part of the state, where greater variability appears to be required on account of the highly variable environmental conditions. The collection is to be made available to maize breeders and geneticists elsewhere.

4645 Koval', A. F.
(Some data on cold tolerance of maize specimens of different origin under the conditions of the Leningrad province).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 68–83 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G464 : p. 46. [Russian].

Early and midseason forms of Soviet origin were the most tolerant of low temperatures at early growth stages. Some cold-resistant forms were selected from material originating from the Netherlands.

4646 Kovács, I.
A "hidegpróba" alkalmazása a kukorica hidegtürőképességének fokozására irányuló nemesítésben. **(The use of the cold test in breeding for increased cold tolerance in maize).**
Növénytermelés 1961 : **10** : 27–42.

Germination in sterilized sand of seeds exposed to 6–8° C. for 9–18 days proved a useful method of testing for cold tolerance. Inbreeding of lines selected for cold tolerance in successive years has been carried out, while maintaining combining ability, and appears to have resulted in a slight improvement in tolerance. Laboratory and field tests have been conducted on a number of hybrids, double crosses, synthetics and local varieties, a close relation between the results of the field tests and the 15–18 day laboratory treatments being found. A number of inbred lines showed good cold tolerance, while Mv5 was the best of the hybrids.

4647 Bonciarelli, F.
Studio agronomico comparato delle popolazioni Umbre di mais. **(Comparative agronomic description of the maize populations of Umbria).**
Maydica, Bergamo 1961 : **6** : 35–61.

Since its introduction in or around 1650, maize has been grown in the neighbourhood of Perugia in Italy and many local types, mostly distinguished by tolerance of summer drought, have been evolved. These have been collected in 20 different localities. All but two are flint types; nine of them are described and illustrated, with full tabular data on morphology and agronomic attributes such as time of flowering and maturity, type of grain and resistance to diseases, lodging, stalk breaking and drought. One form, from Norcia, is distinguished by short stature, few leaves and enlarged cobs; it flowers very early and gives unusually high yields of grain even under quite adverse conditions; this is thought to be conferred by the water-sorting capacity of the enlarged cob. The grain yields of this, and of the races from Gubbio and Perugia, were equal to those from Wisconsin 464. The dent form studied was later than the others in maturity and inferior in yield except where conditions were favourable.

4648 Hoppe, P. E.
A new kernel rot disease of corn in Wisconsin.
Plant Dis. Reptr. 1961 : **45** : 99–105.

The maize inbred W59M is completely susceptible to this bacterial disease. No symptoms were found however on the F_1 hybrid W59M x W117, indicating that susceptibility is recessive.

4649 Hale, M. G. & Roane, C. W.
The nutrition of *Helminthosporium carbonum* race 1 in relation to parasitism of corn.
Phytopathology 1961 : **51** : 235–40.

Studies on certain aspects of the biochemical relationship between *H. carbonum* (*Cochliobolus carbonus*) race 1 and susceptible and resistant maize inbred lines indicated that differences in sugar and aminoacid content could not be directly correlated with resistance to the pathogen.

4650 SUDIA, T. W., WOOD, F. A. & WILCOXSON, R. D.
Some effects of alpha irradiation on *Gibberella fujikuroi.*
Phytopathology 1961 : **51** : 336–37.

Exposure of microconidia to Po^{210} induced mutants with respect to growth rate, colour, colony type, production of gibberellic acid and pathogenicity to maize. Eight of the mutants were more pathogenic than the parent.

4651 FLANGAS, A. L. & DICKSON, J. G.
The genetic control of pathogenicity, serotypes and variability in *Puccinia sorghi.*
Amer. J. Bot. 1961 : **48** : 275–85.

"Four urediospore clones of *P. sorghi* were inbred through the alternate host, *Oxalis*, and the recombinant lines were compared with the mother clones for changes in pathogenicity and serological reaction. The aecial, inbred recombinant lines were scored for pathogenicity on 6 inbred lines of maize, 4 of which contained single, dominant alleles isolated from a single gene locus each conditioning differential rust reaction and Pop 35 and Pop 36, each with 2 recessive genes. The inbred, recombinant lines from each of the 4 mother clones reflected similar dimensional changes from original pathogenicity, that is, an ultimate gain or loss in host range or specificity. Based on reaction type incited on the 4 allelic differential hosts, continued inbreeding through 3 generations did not segregate homozygous pathogenic complements into distinct pathogenic biotypes. A similar array of pathogenic types was produced after each generation of inbreeding. The suppressed pathogenicity types in the dicaryotic lines were revealed only through recombination. Hybridization between dicaryotic lines of selected pathogenic types of sibling and nonsibling pedigree confirmed the indeterminate nature of the pathogenic locus. The genetic basis of the commonly occurring mesothetic-X reaction (necrotic flecks and uredia of varying size surrounded by chlorotic and necrotic areas) is explained by the heterologous complementarity of fit of the interacting genic systems (genetic units). The heterologous mesothetic-X reactions offer ambiguous definition to the specificity state of the interaction and cannot be explained on the discrete gene-for-gene basis of rust reaction. Antisera produced from the pathogenic types differentiated the homologous from the heterologous combinations and revealed cross-reactions with *P. graminis avenae.* The comparative antigen constitution of the urediospore clones and the sibling recombinants thus far reveal a possible parallel existing between the modes of inheritance of pathogenic specificity and antigenic specificity." [Authors' summary].

4652 KOVAL', A. F.
(The resistance to frit fly of maize specimens differing in tolerance of cold).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 83–91 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G465 : 46–47. [Russian].

Forms which were most tolerant of cold were also most resistant to *Oscinella* in experiments at Leningrad. Dents were generally more resistant than flints. The resistance of the material is discussed in connexion with its geographical origin.

4653 GUENNELON, G. & AUDEMARD, H.
La pyrale du maïs, *Ostrinia* (*Pyrausta*) *nubilalis* HBN. (Lépidoptères Pyralidae) dans la basse vallée du Rhone: observations écologiques; incidences économiques. [**The European corn borer, *O.* (*P.*) *nubilalis* HBN. (Lepidoptera, Pyralidae), in the lower Rhone valley: ecological observations and economic incidence**].
Ann. Inst. nat. Rech. agron., Paris : Sér. C 1960 : **11** : 337–96.

The susceptibility of maize varieties to infestation by *P. nubilalis* was found to depend partly on maturity class and date of sowing.

BARLEY

4654 Société d'Encouragement de la Culture des Orges de Brasserie et des Houblons en France. Rapports sur la campagne 1959. (**Society for the Promotion of the Cultivation of Malting Barley and Hops in France. Report for the year 1959**) : Pp. 77.

Of twenty-one six-rowed winter barley strains examined for reaction to natural infection by *Ustilago nuda*, only five became diseased. The 510 F_3 plants obtained from Domen x Carlsberg II included 87 albinos; no albinos appeared among progenies from the reciprocal cross. Progenies from the first cross matured, as a whole, much later than those from the reciprocal. Attempts to improve malt quality by treating germinating seeds with gibberellin revealed varietal differences in response to treatment.

Nine malt characters were studied. While Beka exhibited a maximum response at 0·5 p.p.m. with no further improvement at higher concentrations, Carlsberg and, to a lesser extent, Aurore showed a smaller initial response but continued to improve with increase in concentration.

4655 Forsøg med Bygsorter 1957–60. (**Trials of barley varieties, 1957–60**). Tidsskr. Frøavl 1961 : **25** : 132–34.

Yield data and descriptive notes are given for nine varieties tested at two nitrogen levels at 14 stations in Denmark.

25e N.I.B.E.M. Jaarboekje. (**25th Yearbook of the National Institute of Brewing Barley, Malt and Beer**). 1961 : Pp. 158.

4656 *van Veldhuizen, H. N.I.B.E.M.-Jaarverslag over 1959.* (*Annual report of the National Institute of Brewing Barley, Malt and Beer for 1959*). (*pp. 6–31*).

Barley. Analysis of 30 F_2 populations has provided evidence of the heritability of good malting properties, two good parents tending to give better progeny than one good and one poor and much better progeny than two poor parents.

Yeast. The superattenuating character has been introduced into a normal top yeast by means of DNA extracted from a superattenuating yeast. The transformed strain appears to resemble the donor strain exactly. Transformation of *Pichia membranaefaciens* by DNA from *Saccharomyces chevalieri* has been effected, the transformed cells being able to ferment glucose or both glucose and sucrose; these properties are transmissible to single-spore cultures. A similar intergeneric transformation of *Torula* was also successful. Crosses have been carried out between tetraploid strains and diploid brewing yeasts.

4657 *Coenradie, J. Mout- en brouwproeven op praktijkschaal, oogst 1959.* (*Malting and brewing tests on a commercial scale, harvest 1959*). (*pp. 73–76*).

In full-scale trials of Balder, Ingrid and Union, the first-mentioned variety was best.

4658 *Coenradie, J. & Wilten, W. De veldproeven in 1960.* (*The field trials in 1960*). (*pp. 77–86*).

Gazelle, Bock, Volla, Cambrinus and Delta have outyielded the standard Balder. Of these, Delta and Bock show the least decrease in quality when lodged.

4659 *Wilten, W. Opbrengsten, rassenstatistiek en raseigenschappen van zomergerst.* (*Yields, varietal statistics and varietal characters of spring barley*). (*pp. 87–93*).

Tabulated data on the yield, acreage and agricultural characters of the chief spring varieties grown in the Netherlands in 1960 are given.

Report of the Barley Improvement Conference held at the Pick-Nicollet Hotel, Minneapolis, Minnesota on January 26, 1961 : Pp. 72 + 6. (Mimeographed).

4660 *Shands, R. G. Agronomic performance of barley varieties in the Midwest.* (*pp. 2–4*).

The results of uniform tests of named varieties at 16 stations in the Mississippi Valley during 1959 and 1960 are summarized.

4661 *Stevens, H. V. & Hockett, E. A. Agronomic performance of two-row barley varieties in western states.* (*pp. 5–12*).

Information is given on the performance of entries in uniform tests during 1960 and previous years.

4662 *Dickson, A. D. Results of experimental malting tests on barley varieties and new selections grown in 1959 and 1960.* (*pp. 13–24*).

The results of analyses of the grain and malting quality of barleys grown experimentally in the midwestern and western states during 1959 and 1960 are summarized and discussed.

4663 *Lejeune, A. J. Distribution of barley varieties in midwestern and western states and acceptable varieties of malting barley for 1961.* (*pp. 25–32*).

A varietal survey is presented.

4664 *Peterson, G. A. Progress in the development of superior malting barley varieties for the Midwest.* (*pp. 33–34*).

Improvement of six-rowed barley during the past two decades is outlined, with an indication of current problems. Two experimental lines at an advanced stage of evaluation are equal to Traill in grain yield, time of maturity and test weight, slightly better in straw strength, higher in malt extract and enzymatic activity, and considerably improved in kernel plumpness, unsatisfactory kernel size being an important defect of Traill. Hybrid selections with resistance to foliar diseases are also at various stages of development.

4665 *Nilan, R. A. Malting barley improvement in the Pacific Northwest.* (*pp. 34–42*).

Improvement in Oregon, Idaho and Washington State is reviewed, with reference to present and past market demands, the organization, aims and methods of breeding, and recent developments in breeding and in genetical, cytological and radiation research. In work on developing high-yielding, stiff-strawed, two-rowed varieties equal in quality to Hanna or Hannchen, hybrids from crosses of many of the best European varieties with Hanna and Hannchen are being studied. Selections from the crosses with Hannchen possess yellow-dwarf resistance. In improving six-rowed barley, varieties from the midwestern region have been crossed with locally-adapted varieties with the aim of developing types equal in malting quality to midwestern barleys, such as Traill, but more suitable in several agronomic characters and with wider adaptation. In the attempt to improve the winter hardiness, yield and straw strength of the six-rowed variety Idaho Club (White Winter) at the Pullman station, Wash., difficulty has been encountered in breeding sufficient hardiness. Crosses of the variety and its derivatives with the most hardy barleys in the world collection have therefore been effected. In Idaho, genetical projects on *erectoides* mutants, yellow-dwarf and lodging resistance, and association of characters in two-rowed x six-rowed combinations are under way. At Pullman, studies are in progress on recombination, including increasing the frequency of recombination by irradiation and other treatments. The sensitivity of isogenic loci to irradiation and chemical mutagens is also under investigation. The association between high α-amylase activity and orange lemma has recently been broken by irradiation of a hybrid of Gem (low α-amylase activity, white lemma) and Orange Lemma. A line combining white lemma and high α-amylase activity has now been used in many crosses to raise the activity of this enzyme and the diastatic power of some selections.

4666 *Hunt, L. A. New developments in the industry quality evaluation program. (pp. 43–53).*

To illustrate the value of malting and brewing tests by the industry in the USA in assessing material developed by breeders, evaluation of the following is discussed: (1) two selections bred for superiority over Traill in kernel plumpness, (2) selections developed in projects designed to combine resistance to leaf blights with satisfactory malting and brewing properties and (3) material resulting from breeding to incorporate suitable malting quality in an Atlas type. Examples (1) and (2) apply to barley in the midwestern region, while the third applies to the western area.

4667 *Hannah, A. E. The Canadian malting barley research program. (pp. 54–60).*

An outline of the past and present organization and aims of malting-barley research in Canada is followed by a discussion of the wide range of problems expected to receive attention in future projects on technological aspects and breeding.

4668 CAUDERON, A.
L'orge. **(Barley).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 117–18.

Information is provided on the date of introduction, principal characteristics and present-day significance in France of a number of barley varieties. The two major aims in barley breeding today, increasing resistance to lodging and to fungal diseases, are discussed.

4669 JAIN, K. B. L.
Genetic studies in barley—III. Linkage relations of some plant characters.
Indian. J. Genet. 1961 : **21** : 23–33.

The linkage relationships of the following gene pairs were studied in five crosses: *Vv*, row number; *Ee*, long *v.* short outer-glume awns; *Ycyc*, normal green *v.* virescent seedlings; *Prpr*, purple *v.* white leaf sheath; *Kk*, hooded *v.* awned lemma; *Bb*, black *v.* white lemma and pericarp; *Eheh*, semiprostrate *v.* erect early growth; *Brlbrl*, broad *v.* narrow leaves; and *Eaea*, Ea_2ea_2 and Ea_3ea_3, each of which pairs conditions early *v.* late heading. *Vv*, *Ee* and *Prpr* have been reported by other investigators to belong to linkage group I. The author's data confirmed this relationship; the cross-over values between *v* and *pr* and between *e* and *pr* were respectively 11·74 ± 0·87 and 39·88 ± 2·69%. Cross-over values between *eh* and *brl* and between *eh* and ea_3 were respectively 35·12 ± 4·32 and 38·0 ± 12·53%; ea_3 and *brl* showed independent inheritance. The order of these genes is therefore concluded to be ea_3–*eh*–*brl*. None was linked with markers in group I. The possibility that these genes belong to group V is considered. *Ycyc*, *Kk*, *Bb*, *Brlbrl* and Ea_3ea_3 were inherited independently of *Vv* and *Ee*. *Eheh*, *Brlbrl*, Ea_3ea_3 and *Ycyc* were independent of *Prpr*, while *Kk* was independent of *Bb*. [Cf. XXX, 3928 and XXXI, 430].

4670 SCHOOLER, A. B.
Wild barley hybrids. II. *Hordeum marinum* x *Hordeum compressum*.
J. Hered. 1960 : **51** : 243–46.

The author has suggested in a previous paper [1906] that interspecific hybrids of *Hordeum* may cross more readily with cultivated barley than with the parents of the hybrids. The present study is primarily concerned with the transfer of genes for resistance to *Cochliobolus sativus* from wild species to cultivated barley. Two lines of *H. marinum*, one highly resistant and the other moderately resistant to the disease, were crossed with *H. compressum* (highly resistant). The hybrids, obtained with the aid of embryo culture, were sterile. Seeds were however produced after colchicine treatment, administered by submerging the crowns and roots in a 0·05% solution. The allotetraploids ($2n = 28$) thus secured closely resembled the F_1 hybrids but were highly fertile. Meiotic observations on the F_1 indicated a nearly complete absence of homology between the chromosomes of the two species. The allotetraploids were almost completely normal in meiosis, only a few irregularities, such as fragments and bridges, being noted. Micronuclei were seen in some dyads and tetrads. No segregation or abnormal plants occurred in the first and second generations of the allotetraploids.

4671 KIRIYAMA, T. & KONISHI, T.
(Studies on the effect of selection in barley breeding. III. Discrimination of combinations for breeding a very early-maturing variety of naked barley).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1960 : **6** : 155–67. [Japanese].

Sakai's theory of selection [XXVI, 1971] is applied to the F_0–F_4 of five crosses, the characters studied being heading period, stem length, spike length and number of spikes per plant. For each character, means and variances were determined for each generation and estimates were made of the *D*, *H* and *E* components and heritability. Genotypic and phenotypic correlations between heading period and the other characters were determined and also the frequencies of the genes *Uz* (normal height), *N* (hulled) and *L* (lax spike) in each generation. It was noted, in comparing the observed F_4 values with those expected from the F_0–F_3 data, that there was a drift toward later heading and longer stems and spikes in successive generations. [Cf. XXVIII, 4215–16].

4672 KIRIYAMA, T. & KONISHI, T.
(Studies on the effect of selection in barley breeding. IV. On variation of economic characters under different conditions of cultivation).
Kyushu Nogyo Shikenjo Ihō/Bull. Kyushu agric. Exp. Sta. 1960 : **6** : 169–80. [Japanese].

A series of Japanese varieties were grown under three conditions: (1) direct sowing, (2) nursery sowing followed by transplantation to single-drilled rows and (3) as (2) but with double-drilled rows, in two successive years. The characters studied were heading period, stem length, spike length, number of spikes per plant, number of fertile triplets per spike, spike density and weight of spikes per plant. Analysis of variance showed significant effects due to varieties, conditions, years, varieties x conditions, and varieties x years. Estimates were made of genetic, environmental and genetic x environmental variances and heritabilities, after direct sowing and transplantation. Correlations between the characters were also determined. The relative value of various selection indexes for grain yield utilizing the data mentioned above was assessed.

4673 HÄNSEL, H.
Neue Ergebnisse der Strahlen-Mutationsforschung bei Getreidearten. **(New results of research on radiation mutation in cereal species).**
Schr. Ver. naturw. Kenntn. Wien 1958–59 : **99** : 103–21.

An analysis of chlorophyll mutants in 800 X_1 ear progenies of barley revealed ratios somewhat lower than 4 normal : 1 mutant in the segregating progenies. On the assumptions (1) that selfing occurred in the X_1 plants, (2) that the different mutations were each conditioned by a single recessive gene and (3) that a certain degree of haplontic selection took place which would tend to change the expected 3 : 1 ratio to 4 : 1, it is concluded that, on the average, the entire X_1 ear consists of mutated tissue and has therefore probably arisen from only a single meristematic cell.

A single recessive gene governing the *erectoides* habit in Er. 503, an induced mutant of the barley Vollkorn [Round Grain], had a pleiotropic effect, as evidenced by the following comparisons between normal and mutant plants. (*a*) The mutants had a shorter shoot and primary root in the seedling stage. (*b*) Of 27 characters studied, 18 differed in expression in the mutants and normal plants, the main differences being in size rather than number of parts. (*c*) The length/breadth indices of seed, lamina, straw, anthers and the epidermal cells of the lamina were smaller in the mutants. (*d*) The straw length of the mutants was 85% of that of normal plants, but the relative lengths of the internodes of the ears and straw were the same in both forms. Lodging resistance was greater in the mutants, but yield was lower in dry years, i.e. when lodging was also absent in the initial material. The lower yield could be attributed to the smaller surface area of photosynthetic tissue in the stems and leaf sheaths of the mutants.

4674 KONONOVA, O. A.
(The method of grafting in barley breeding).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 70–72. [Russian].

Embryo grafts of one variety of barley on to another or on to wheat mostly gave rise to plants morphologically resembling the form from which the embryo was taken but a certain number displayed features characteristic of the receptor variety; some of these have given rise to promising lines of awnless naked barley.

4675 TOVMASJAN, O. V.
(Vegetative hybridization of barley).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 142–44. [Russian].

Vegetative hybrids were obtained by grafting embryos of Pallidum 32 on endosperms of hooded barley. The hybrids were essentially similar to Pallidum 32 but in some ears, awns reminiscent of hooded awns were observed; in addition, glumes were partially or completely detached from a number of caryopses, another characteristic of hooded barley. These changes were maintained in the first generation progeny of the hybrids.

4676 LAZÁNYI, A.
Linii noi de orz de toamnă. **(New lines of winter barley).**
Lucrăr. şti. Inst. agron. P. Groza, Cluj 1960 : **16** : 41–44.

Lines of Cenad 396 barley showing improvements in yield and winter hardiness have been obtained by grafting embryos of this variety on winter-wheat endosperms.

4677 GARKAVYJ, P. F.
(Breeding a winter barley on the basis of directed training and hybridization).
Nauč. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 83–114. [Russian].
[Cf. XXVI, 3316].

4678 SCHOBER
Neue Gerstensorten. **(New barley varieties).**
Landwirtschaft 1961 : No. 2 : p. 6.

Union is a spring variety which produces many tillers and consequently a high yield, provided the supply of water is adequate during the tillering period. It has good standing capacity and is resistant to mildew; in Germany this variety has shown good malting quality. Paula, another spring variety, is highly productive and stands well. It may replace Herta, which it resembles, in some parts of Austria.

4679 SCHOBER
"Union"—eine Braugerste. **(Union—a malting barley).**
Landwirtschaft 1961 : No. 4 : p. 2.

This high-yielding malting variety has been released in Lower Austria.

4680 HÄNSEL
"Vienna"-Gerste eine Qualitätsgerste mit hohem Ertrag und guter Standfestigkeit. **(Vienna barley, a quality barley with a high yield and good standing capacity).**
Landwirtschaft 1961 : No. 4 : 5–6.

This new Austrian variety is superior to Vollkorn [Round Grain] in yield, straw elasticity and mildew resistance and is equal in malting quality.

4681 BREŠKOV, T.
(Varieties of winter barley in Bulgaria).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 70–71. [Russian].

In this account, particular mention is made of four high-yielding *pallidum* varieties, 1241, 5652, Sofia 1294 and Sofia 1337. The last three of these are resistant to lodging, while all but 5652 are reported to be drought resistant.

4682 Wells, S. A., McBean, D. S. & Kusch, A. G.
Note on Palliser barley.
Canad. J. Pl. Sci. 1961 : **41** : 440–41.

Information is given on the origin, main attributes and adaptation of the above variety [cf. XXX, 4542].

4683 **Classification of barley varieties grown in the United States and Canada in 1958.**
Tech. Bull. US Dep. Agric. 1961 : No. 1224 : Pp. 234.

This bulletin supersedes the previous one which appeared in 1946 [XVII, 208].

4684 Schöller, F.
Über die Erkennung von Braugerstensorten am Korn. (**On the identification of malting barley varieties by means of the grain**).
Z. Acker- u. PflBau. 1961 : **112** : 161–83.

Of ten grain characteristics studied in a collection of German varieties, only the phenol colour reaction, the length of the rachilla hairs in relation to the length of the grain, the hairiness of the ventral groove and the shape of the lodicule were constant varietal characters. The first three of these characters allow eight groups to be distinguished, within which the varieties may be differentiated according to lodicule shape and the other, more variable, characters.

4685 Zwoboda
Liechtensteingerste. (**Liechtenstein barley**).
Landwirtschaft 1961 : No. 7 : 13–14.

In trials at the Federal Crop Production Institute, Vienna, the above new variety has yielded 40–50 c. per ha. under moderately favourable conditions and proved to be the best variety with respect to malting quality.

4686 Grif, B. G.
(**The diurnal periodicity of mitoses in barley meristems**).
Citologija (Cytology) 1959 : **1** : 229–33. [Russian].

The number of dividing cells in the root and shoot apical meristems of barley plants at the 2-leaf and 4-leaf stages was estimated at 3-hourly intervals. The percentage of mitotic cells in both meristems was highest at 18.00 hr. and lowest at 6.00 hr. Diurnal variations in temperature did not correspond with variations in mitotic activity. Light, rather than temperature, appears to be primarily responsible for mitotic periodicity.

4687 Starzycki, S. & Szepieniec, A.
Badania procesu napełniania ziarna pięciu odmian jęczmienia jarego na tle zawartości wody w łodydze i liściach. (**Studies of the grain-development process in five spring-barley varieties with respect to the water content of the stems and leaves**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 503–11.

Varietal differences in loss of water during the course of grain development were detected in studies conducted at the Polish Institute of Plant Breeding and Acclimatization.

4688 Mazurek, J. & Ruszkowski, M.
Próba przemiany biotypów u dwóch odmian jęczmienia jarego. (**Test of the conversion of biotype in two varieties of spring barley**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 525–32.

At the Puławy Cereal Laboratory, Poland, repeated autumn sowing in successive years resulted in a transformation of the spring variety Sobieszyński into a winter type but not of the spring variety Puławski; Sobieszyński is thus described as a population and Puławski as a pure spring genotype. The transformed barley was earlier than the initial material and was more resistant to smut than the winter varieties Śląski I and Mikulicki but was inferior to these two in yield.

4689 Avakjan, A. A. & Šumanskaja, M. G.
(**Mode of development of hybrid plants from crosses of alternative types with spring and winter varieties**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 7 : 44–51. [Russian].

Two alternative barleys, Od.–17 and Pallidum 32, were crossed with a spring form of Pallidum 32 and with a winter barley from Yugoslavia. The F_1 from the crosses with the spring parent all eared normally when spring sown whereas those with the winter barley eared only at the end of the season. In the F_2 from the hybrids with the winter barley most plants behaved again as winter forms, the number of plants that formed ears when spring sown varying from 14·8 to 36·7%, with a mean of 24·5%. In the F_2 from the crosses with the spring parents all plants behaved as spring forms.

F_1 hybrids from a number of other crosses of alternative x winter barleys were spring sown and subjected to continuous light and high temperature; all behaved as winter forms. Their reaction to vernalization was also that of true winter forms.

In the crosses of alternative x winter forms, some of the F_2 plants that eared on spring sowing were crossed with winter barley; all the progeny behaved as winter forms, which is taken as evidence that the F_2 plants that eared were alternative, not spring forms, since spring habit is dominant. The alternative forms, and hence their hybrids with winter barleys, differ in the length of their vernalization stages; they are however all regarded as winter rather than spring forms, those with the longest vernalization being considered the most "conservative in respect of winter habit."

4690 Suge, H.
(The physiology of heading in barley. I. Response to photoperiod after vernalization, with special reference to the relation with temperature).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 163–68. [Japanese].

Heading period was determined for a series of Japanese varieties and some wild forms. The grains were vernalized and then grown (1) in a greenhouse or (2) in the open. Photoperiods of 10, 13 and 24 hr. were applied. The maximum intervarietal differentiation occurred under 10-hr. photoperiods in the greenhouse.

4691 Suge, H.
(The physiology of heading in barley. II. The response of heading to different temperature and photoperiod pretreatments).
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 10–18. [Japanese].

Information is given on the course of development and leaf number of some Japanese cultivated barleys and some wild forms pretreated with 8 hr., normal and 24 hr. photoperiods, either in the open or in a greenhouse, and then transferred to a greenhouse and grown under 24 hr. photoperiods. Varietal differentiation was most evident after pretreatment under 24 hr. photoperiods in a greenhouse.

4692 Lunden, A. O. & Wallace, A. T.
Some effects of ultraviolet light on barley and oat embryos.
Crop Sci. 1961 : **1** : 212–15.

The genetic studies reported relate only to barley; the variety Florida Experimental 1079 was used and only the terminal apices of the embryos were exposed to ultraviolet light. From about 1500 treated seeds the following chlorophyll-deficient progenies were obtained: 6 segregating for albinism, 5 for the *xantha* type, 1 for the *viridis* type and 1 for variegated seedlings. Exposure was most effective when doses greater than 20,000 ergs/mm². were used and when seeds had been soaked for between 30 min. and 24 hr.

4693 Hod'kov, L. E.
(Breeding awnless naked barley).
Trud. Leningr. Obšč. Estestvoispyt. (Res. Leningr. Soc. Natur.) 1959 : **70** : No. 1 : 39–42 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G511 : p. 48. [Russian].

The six-rowed awnless naked barley GB18 is recommended as breeding material. It is hoped to breed two-rowed varieties of similar type by crossing GB18 with the hulled awned variety Viner.

4694 Hod'kov, L. E.
(Breeding of naked and awnless barley varieties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 2 : 57–58. [Russian].

GB 18 was obtained from the cross of a Japanese and a Chinese barley at the Institute of Plant Industry. It is a shedding-resistant, six-rowed, awnless form with naked seed. The low yield of GB 18, caused by empty seed, and its drought resistance have been improved by directed training and selection carried out for a number of years at Odessa and it is now recommended as breeding material for the production of other naked awnless barleys. One such hybrid was bred from the two-rowed barley Kolhoznyj 7 [Collective Farm 7] x GB 18 in Leningrad. The F_1 possesses the above desired characters and has long ears and large grain; selection will be carried on in the F_2 and later generations as they become available.

4695 Gołębiewski, T.
Wyniki badań nad przydatnością słodowniczą krajowych odmian jęczmienia browarnego. **(The results of tests of suitability for malting in local varieties of malting barley).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 721–30.

The defects of certain criteria such as protein content and 1000-corn weight in assessing quality are pointed out. The most suitable criterion was found to be the yield of malt extract from 1 ha. of the crop. Three Polish and two imported barleys were analysed in 1955, 1956 and 1957. The results showed malt from the Polish barleys PZHR, a derivative of Isaria, and Hanna-Kleszczewski to be richer in diastatic activity than that from Skrzeszowicki; Isaria was roughly equal to PZHR but Carlsberg II was inferior. Skrzeszowicki had the highest values for disintegration of the endosperm during malting. The solubility of the protein in the malt from Carlsberg II was constantly inferior to that from other varieties by 0·45–0·51%. Skrzeszowicki was inferior in respect of the glutinous quality of the malt produced from it, that from PZHR being the least glutinous.

PZHR, Hanna-Kleszczewski and Isaria had high protein contents, Skrzeszowicki and Carlsberg II both had low. The last two varieties both had a high enzyme content but produced malt of inferior quality; the malting process was also slower; they exceeded the other varieties in grain yield, Skrzeszowicki having exceeded the mean yield by 0·3–2·2 c. per ha. PZHR gave the highest yields in the high-protein group and its grain was the most uniform and gave the highest yield of extract; this was 28, 62·8 and 40·9 kg. per ha. greater than the mean for all varieties in the three successive years, that from Skrzeszowicki being 7·9, 64·0 and 61·9 kg. per ha. below the mean.

None of the varieties met the requirements of the International Brewing Convention but PZHR made good its inferior yield of grain by its regular size, only average loss of dry matter during malting, and high extract and solubility and in this way gave a higher yield of extract per ha. than varieties with a higher grain yield; these properties were moreover constant over the different years. Polish breeders are advised to make efforts to improve the yielding capacity of this variety.

4696 **Quality evaluation of barley varieties and selections grown in 1959.**
Quality Publ. Malt. Barley Improv. Ass., Milwaukee 1960 : No. 17 : Pp. 19.

A report is given of pilot and commercial malting and brewing tests carried out in the USA on early-stage selections and named varieties during 1959.

4697 Mazurek, J.
Zmiany składników białkowych niektórych odmian jęczmienia browarnego pod wpływem proteolizy. (**Changes in the protein components of certain malting barley varieties as influenced by proteolysis**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 617–29.

Malt prepared from 15 barley varieties was analysed for content of aminoacids and water-soluble protein, the ratio of the two being taken as an index of the enzyme activity. No correlation was found between this activity and yield. Thus Carlsberg II, which was highest in yield was one of the lowest in proteolytic activity; this was highest in the malting barley PZHR and lowest in a six-rowed fodder barley Mazowiecki.

4698 La variété, facteur important dans l'action de la gibberelline. (**The variety —an important factor in the action of gibberellin**).
Brasserie 1961 : **15** : 84–90.

The effect on malt quality of treating germinating barley seeds with various dosages of gibberellin was found to vary with variety [cf. **4654**].

4699 Middleton, G. K., Reid, D. A., Hebert, T. T. & Davis, W. H.
Varietal differences in protein content of barley.
Agron. J. 1961 : **53** : p. 206.

To obtain information on the protein content of varieties commonly grown in the south-eastern part of the USA, samples of 18 varieties grown in the uniform nurseries of semihardy varieties in 1957–58 were collected from 13 experiment stations for analysis. Protein percentage ranged from 10·93 in Calhoun x Bolivia–954 to 9·45 in Dayton. Variation according to locality was much higher. Differences for varieties and locality and the variety x locality interaction were highly significant. No significant relationship was found between grain yield and protein content.

4700 Bhide, V. S.
Backcrossing in barley to introduce lodge resistance in BR$_{22}$.
Indian Agric. 1960 : **4** : 144–46.

A report is given on progress made in introducing the character of lodging resistance of the short, stiff-strawed variety type 11 into the tall, susceptible variety BR$_{22}$ by continuous back crossing at the Agricultural Research Institute, Sabour, Bihar. Selection for resistance is effected by applying flood irrigation and slightly bending the plants at the nodes, plants resisting this treatment being chosen for back crossing. The third back cross has offered promising material for further selection and back crossing.

4701 Rohde, C. R. & Pulham, C. F.
Genetic studies of winter hardiness in barley.
Res. Bull. Neb. agric. Exp. Sta. 1960 : No. 193 : Pp. 48.

Studies on the winter hardiness of the bulk F_2s and bulk F_3s from 18 barley varieties crossed in a diallel series are reported [cf. 1926]. The winter survival data indicated that the varieties possessed different combinations of genes conditioning this character, and phenotypic expression ranged from complete dominance of winter hardiness to complete dominance of susceptibility; the major gene effects appeared to be additive. Resistance to leaf damage also varied with variety, reactions ranging from dominant resistance to dominant susceptibility; dominance was however incomplete in most crosses.

The F_2 segregation ratios of three simply inherited characters, kernel row number (*Vv*), lemma colour (*Bb*) and male fertility (*Msms*), were studied after winter killing to discover whether any of these characters was linked with winter hardiness genes. The inheritance of *Vv*, which is located in linkage group I, fitted a 3 : 1 ratio in 16 out of 17 crosses examined; Meimi x Khayyam was the exceptional cross. Of 45 crosses segregating for *Bb*, which is in linkage group II, 32 deviated significantly from the 3 : 1 ratio, all showing a deficiency of plants with coloured lemmas. *Msms* was concluded to be located in a linkage group other than I and II; the group containing this gene pair appears to be an important centre for genes determining winter survival since 66 out of 153 crosses had significant shortages of ♂ sterile plants, and 65 of the remaining crosses had nonsignificant shortages. Since the shortages occurred in crosses where the ♂-sterile parent was the more hardy parent as well as where it was the less hardy parent, it was concluded that a gene or genes for winter susceptibility was introduced into many of the varieties with the ♂-sterile factor pair. The ♂-sterility genes were associated with a slight increase in number of tillers per plant and a decrease in plant height; reductions in plant height ranged from 0·2 to 9·3 in. Additive gene action was of primary importance in controlling tillering and plant height.

4702 Sowa, W.
Badania nad odpornością na wyleganie słomy czterech odmian jęczmienia ozimego. (**Investigations on the lodging resistance of the straw of four winter barley varieties**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1961 : **5** : 99–115.

In two two-rowed and two six-rowed varieties studied at the Plant Breeding and Seed Production Laboratory, Warsaw, lodging resistance was associated with the following stem characters: a greater distance between the epidermis and the vascular bundle in the parenchymatous layer; a higher proportion of sclerenchymatous tissue in the culm wall; a greater number of bundles; a thicker culm wall; a smaller distance between the vascular bundles in the sclerenchymatous layer; and thicker culms. The two-rowed barleys were more resistant than the six-rowed. Lodging resistance was also estimated by the methods of Grafius and Brown [cf. XXV, 252] and Ruebenbauer and Riegerowa [cf. XXVII, 1618]. The latter appeared to be the most sensitive of the methods tested.

4703 Johansen, H. B.
Methods to determine the field resistance of cereals to powdery mildew (*Erysiphe graminis* DC).
Årsskr. k. Vet.- o. LandbHøjsk., Kbh. 1961 : 106–14.

A field test, in which natural infection levels are artificially raised by the use of heavily infected potted plants, is described. Tests on 30 barley varieties have shown the method to be useful in assessing field resistance. The resistance of 15 of these varieties was also assessed in a greenhouse test designed to give results as closely correlated as possible with those of the field test. Good correspondence was found between the ranking of varieties by the two methods.

4704 Niemann, E.
Flugbrandresistente Gerstensorten. (**Loose-smut resistant barley varieties**).
Z. Pflanzenz. 1961 : **45** : 8–16.

Seventeen winter varieties and 50 spring varieties were inoculated over a period of 3–5 years with a mixture of about 200 central European collections of *Ustilago nuda*, containing the 16 races known to occur in Germany. The spring varieties Blaue Nackte [Blue Naked], Kitchin, Abyssinian, CI5798 and CI3210–5 were entirely free from smut; the winter variety Engelens II and the spring varieties Velvet, July, CI5324 and strain 93, a new Western German line, showed up to 5% infection; and three further winter barleys and five spring barleys were 6–19% smutted. The spring-variety Jet, regarded as immune in the USA, was slightly infected in the first year and thereafter not at all.

4705 Bobeș, I.
Eficacitatea unor măsuri agrotehnice în combaterea tăciunelui zburător al orzului (*Ustilago nuda*) din loturile pentru sămînță. **(The efficacy of some agrotechnical measures in combating loose smut of barley (*U. nuda*) in seed lots).**
Lucrăr. ști. Inst. agron. P. Groza, Cluj 1960 : **16** : 177–85.

In the course of this investigation, some observations were made on varietal differences in susceptibility. The most resistant varieties were Tîrgu Frumos 240 and Pisarev.

4706 Bobeș, I., Persecă, E. & Rîpeanu, G.
Rezultate experimentale cu privire la combaterea sfîșierii frunzelor de orz (*Helminthosporium gramineum*) prin metode agrotehnice și chimice. [**Experimental results on combating barley stripe (*H. gramineum*) by agrotechnical and chemical methods**].
Lucrăr. ști. Inst. agron. P. Groza, Cluj 1960 : **16** : 187–94.

Some investigations were made on relative varietal susceptibility. The varieties least affected were Urania, Vindicat, Sibiu, Mezőhegyes 56, Hatvani and Mahndorf.

4707 Horber, E.
Sortenabhängigkeit der Ertragseinbussen an Wintergerste infolge unterschiedlichen Befalles durch die Fritfliege (*Oscinella frit* L.—Dipt. Chloropidae). [**Varietal differences in yield loss in winter barley as a result of differential attack by frit fly (*O. frit* L.—Diptera, Chloropidae)**].
Z. Pflanzenz. 1961 : **45** : 55–68.

In tests of 12 varieties at Zürich-Oerlikon, Switzerland, over the period 1956–58, differences in attack were detected between years but were greater between varieties. Hauter, Firlbeck I and Atlas were particularly resistant. A positive association between resistance and earliness was observed in some varieties.

4708 Trofimovskaja, A. Ja. & Popcova, L. T.
(The problem of phasic development in winter barley).
Agrobiologija (Agrobiology) 1960 : No. 1 : 53–56. [Russian].

Considerable variability in photoperiodic and vernalization requirements was observed in winter barleys of different origin at the Institute of Plant Industry. It is held that the variability in these respects can be utilized in breeding new varieties adapted to adverse overwintering conditions.

MILLETS AND SORGHUMS

4709 Mihajlec', V. I.
(Local millet forms from L'vov province and their improvement by breeding).
Zborn. nauk. Prac'. nauk.-dosl. Inst. Zemlerobstv. Tvarinnictv. Zahidn. Rajon. Ukrajin. RSR (Symp. sci. Wk. sci.-res. Inst. Agric. Anim. Husband. W. Distr. Ukrain. SSR) 1959 : No. 11 : 68–72 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G557 : p. 52. [Ukrainian]

Varieties recently selected from local material at L'vov outyielded the standard Har'kov 436. Advanced trials are in progress.

4710 Korčenjuk, Ja. T.
(The millet Veselyj-Podol 38).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 4 : 71–72. [Russian].

The variety described was selected from a millet from the Dnepropetrovsk district; it matures in 80–103 days, is resistant to drought, smut and *Stenodiplosis panici*, is free from shedding and has grain of the highest quality, its protein content being 0·5–0·9% higher than that of other varieties grown in the steppes. It yields 2–4 c. per ha. more grain than varieties previously grown.

4711 Il'in, V. I.
(Ways and methods of millet breeding in the South-East).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 2 : 54–57. [Russian].

An account is given of millet breeding and improved pollination techniques used at the Agricultural Institute of the South-East in Saratov. First, empty glumes on the flowers of the seed parent are shortened and all anthers removed from the flowers. Then the stigmas are wedged in firmly between the flowering glumes so that the pollen from the panicle of another variety, which is introduced under the bag, may alight on them. Many crosses involving several botanical varieties were made in this way and several hybrids with high yields and satisfactory gruel quality have been produced. The best results were obtained by crossing high-yielding midseason *aureum* forms with the early, drought-resistant local red-grained varieties. Four hybrids of this are listed.

4712 Jašovskij, I. V.
(An effective method of hybridization for millet).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 69–70. [Russian].

Panicles in which one third of the florets have already flowered are rubbed between the palms during the hours of darkness, between 2 hr. and daylight, and then immersed for 1–2 minutes in a pail of water to prevent dehiscence of the anthers. Emasculation is then performed, the immersion in water being repeated at intervals of 1·5–2 mm. Pollination is effected by shaking a flowering panicle over the emasculated one. Sets of 37·5–50·3% were obtained by using this method and the proportion of hybrid grains was 86·5–95·0%.

4713 Bor, N. L.
Two confused species of *Panicum*.
Feddes Repert. 1960 : **63** : 328–31.

The epithet of the millet commonly known as *P. miliare* Lam. is rejected since Lamarck's type specimen is *P. antidotale* Retz. The first available epithet for the former is *P. sumatrense* Roth.
P. notatum Retz. is the same as the previously described *P. montanum* Roxb.

4714 Korohoda, J. & Jeśmanowicz, A.
Zastosowanie graficznej metody porównywania czumizy różnego pochodzenia. **(Application of the graphical method of comparison of millet of different origin).**
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 102–11. (Mimeographed).

A method described by Jentys-Szaferowa [cf. XXIII, 1499] was applied to samples of *Panicum italicum* of different provenance. In several cases samples of widely different provenance showed marked similarities and were ascribed to the same botanical variety.

4715 Ščeglov, Ju. V.
(The sensitivity of different varieties of millet to the sodium salt of 2,4-D).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 5 : 126–28. [Russian].

Treatment of two varieties in weed-free plots caused a reduction in grain yield in one, Novo-Urenskoe 241, which is an early variety, whereas Dolinskoe 86, a late variety, showed no reduction. In a further experiment with ten varieties the earliest proved to be the most affected.
No increase in sensitivity was observed in the later generations of plants sprayed in each successive generation.

4716 Express Gončarov, P. L.
(*Setaria italica* ssp. *maximum* and ssp. *mocharium* in Omsk province).
Agrobiologija (Agrobiology) 1960 : No. 1 : 141–43. [Russian].

A table gives the hay and seed yields of a few varieties of the above plants tested at the Siberian Agricultural Institute.

4717 Alekseeva, E. S.
(Choosing the parental forms for breeding hybrid varieties of *Setaria*).
Agrobiologija (Agrobiology) 1960 : No. 3 : 383–85. [Russian].

Breeding *Setaria* for earliness and high yield at the Williams Forage Institute was facilitated by studies on photoperiodic reactions of the parent varieties. Good results were obtained by crossing a less productive early variety with a high-yielding late variety which shows a weak photoperiod response in the early stages of development. Hybrid 82 (Baškirian ♀ x Belozernyj [White-grained]) is not only more productive of forage than its early maternal parent but is also appreciably earlier.

4718 Ratnaswamy, M. C.
Development of spikelets—a new Mendelian character in the Italian millet (*Setaria italica* Beauv.).
Madras agric. J. 1961 : **48** : 25–27.

A few plants produced panicles without spikelets, each spike bearing bristles instead of normal spikelets. The plants, which were discovered in a Japanese variety at the Millets and Pulses Breeding Station, Coimbatore, were otherwise normal. The selfed population segregated into normal and abnormal individuals in a ratio of 15 : 1.

4719 Mirošnikov, V. N.
(The length of the light phase in some *Setaria* varieties).
Agrobiologija (Agrobiology) 1960 : No. 3 : 443–46. [Russian].

An account is given of studies on photoperiodism of a few varieties at Orenburg in 1952–54.

4720 Chavan, V. M. & Patil, J. A.
Bajri breeding procedure.
Poona agric. Coll. Mag. 1961 : **51** : No. 3–4 : 1–12.

An account is given of the methods used in breeding *Pennisetum typhoides* at the Agricultural Research Station at Niphad.

4721 Anavaradham, L. & Subramaniam, A.
A note on the evolution of synthetic variety in cumbu (*Pennisetum typhoides*).
Madras agric. J. 1961 : **48** : 141–42.

Three high-yielding F_1 hybrids have been released for commercial cultivation, as the result of work at the Millets Breeding Station, Coimbatore, Madras, but increase in their use is hindered by difficulties in seed production and distribution. A test of the F_1, F_2 and F_3 of a synthetic has therefore been made. The synthetic, derived from six inbreds, was produced by mixing (1) equal proportions of the seeds of the inbreds and (2) seeds of 15 single crosses between the six parents. The reduction in yield from the F_1 to F_3 was about 13–15%, as against the decrease of 42–87% previously found for single-cross hybrids. Method (2) had no advantage over (1).

4722 Samathuvam, K.
Further studies on the performance of two early strains of ragi.
Madras agric. J. 1961 : **48** : 61–63.

From the results of trials of the short-duration varieties EC4713 and EC4728 of *Eleusine coracana* for three years, it is concluded that the latter is especially promising for the South Arcot and Chingleput districts, Madras State. It requires 85 days from sowing to ripening.

4723 Sarré, M. F.
(Remove the defects in breeding and seed production of sorghum).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 48–50. [Russian].

In spite of the many merits of sorghum as an agricultural crop and the existence of some 30 cultivars in the Soviet Union, its cultivation is diminishing rather than increasing. One of the reasons for this is thought to be the neglect of breeding and seed production, particularly the production of cultivars adapted to the conditions of different areas. Attention to this would, it is thought, be more valuable than producing hybrids between sorghum and Sudan grass, which have so far given nothing but disappointments, being inferior to Sudan grass in tillering capacity and number of cuts and having a higher content of HCN.

4724 Ivanjuk, L.
(A drought-resistant crop plant).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1960 : No. 1 : p. 41. [Russian].

Sorghum is valued as a grain crop in the Rostov province, as it is drought resistant. Several varieties and hybrids which in recent trials have outyielded the local standard by 10–24 c. per ha. are listed. They have growth periods of 100–109 days and a habit suitable for combine harvesting.

4725 Cypert, C. E., Williams, D. H., Jones, H. D. & Matches, A. G.
Performance of sorghum hybrids and varieties in New Mexico, 1960.
Res. Rep. N. Mex. agric. Exp. Sta. 1961 : No. 51 : Pp. 26.

A report is given on trials of grain and forage sorghums at four substations.

4726 Nelson, C. E. & Roberts, S.
Agronomic evaluation of eight grain sorghum varieties under irrigation and a method for predicting potential stalk breakage.
Bull. Wash. St. agric. Exp. Sta. 1961 : No. 626 : Pp. 10.

Eight varieties commonly grown in Washington State were studied, at five densities of population, with respect to yield, tillering, maturity and plant characteristics affecting stalk breakage. The results of mechanical-breakage tests of the stalks when the plants were fully headed were correlated at the 1% level of significance with natural stalk breakage in the field in autumn. Resistance to mechanical breakage decreased as density of population increased. On account of differences in wind resistance in relation to plant height and weight per head, these two characters must be considered in comparing varieties by the mechanical-breakage test. A method of converting height, mechanical breakage and head weight into a stalk-breakage factor is given for predicting stalk breakage occurring naturally in the field.

4727 Sriramulu, C., Prasada Rao, G. P. & Ramachandra Rao, S.
A mutant in sorghum—strain No. G4.
Andhra agric. J. 1961 : **8** : 26–27.

A variant of *Sorghum durra* 'G4', found at the Agricultural Research Station, Lam, Andhra Pradesh, differs mainly from the parent variety in being ten days earlier in ripening and in possessing compact and smaller panicles. In view of its earliness, the variant is being studied as a possible substitute for G4.

4728 Sreeramulu, C. & Ramachandrarao, S.
Segregation for lanky and normal seedlings in sorghum.
Curr. Sci. 1961 : **30** : p. 188.

Tall slender seedlings with long narrow leaves appeared in the F_2 of a cross between ♂ sterile A6697 (from the USA) and the Indian variety IS1032. The mutant seedlings had poorly developed root systems and were of a lighter green colour than normal seedlings. Segregation data indicated that the "lanky" type is monogenically inherited and recessive.

4729 Ross, J. G., Foster, A. E. & Franzke, C. J.
Identity of a mutated gene for strong awns in a colchicine-induced true-breeding mutant in sorghum.
Crop Sci. 1961 : **1** : p. 156.

M15, a colchicine-induced mutant of Experimental 3 (E3) was crossed with a strong-awned irradiation-induced mutant of E3 and with Black Amber Cane, a strong-awned ancestor of E3. Genetic analysis of the progeny showed that the same locus was involved in the control of strong awn in all three lines. The possibility that colchicine-induced mutants arise as a result of the mutagenic action of substances derived from metabolites within colchicine-induced tumours is discussed.

4730 Hsi, C. H.
An effective technique for screening sorghum for resistance to charcoal rot.
Phytopathology 1961 : **51** : 340–41.

Devised with a view to developing hybrids resistant to charcoal rot (*Macrophomina phaseoli*), the method described entails growing the plants properly spaced in infested soil in a greenhouse under the stress conditions of extreme heat and insufficient water supply during the period of ripening.

RICE

4731 Angladette, A.
Compte rendu de la Septième Session de la Commission Internationale du Riz, Saïgon (Viet-Nam), 16–20 nov. 1960. [**Proceedings of the Seventh Session of the International Rice Commission, Saigon (Viet-nam), 16–20 Nov. 1960**].
Riz et Rizic. 1961 : **7** : 37–40.

A brief account is given of rice-breeding work in progress in various countries.

4732 Valente, E. M. (E. G.).
O arroz em Moçambique. I. O clima e o solo. II. Cultura, melhoramento, caracteres diferenciais. (**Rice in Moçambique. I. Climate and soil. II. Cultivation, improvement and differential characters**).
Melhoramento 1958 : **11** : 67–132; 1959 : **12** : 51–162.

A general outline is given concerning rice growing in Moçambique. Wild rice belonging to the species *Oryza barthii* and possibly also *O. fluitans* occurs in Moçambique. Details are given concerning the varieties of cultivated rice grown in different parts of the province. Many of them are extremely mixed and an account is given of the improvements that can be effected by mass selection and pedigree selection; by the latter method improvements of up to 30% in yield have been attained in some varieties in Moçambique. A distance of 2 m. in all directions is used for spatial isolation of each plant. Data are presented on the number of flowers to open in the variety Nero Vialone on successive days; each flower remained open for a period varying from 37 to 82 min., the average being 57 min.

Attempts have been made to cross the variety Gaza, distinguished by high yield but proneness to lodging and shedding, with Tile, an early variety of low yield but free from these defects, but the crosses have not yet been successful.

A collection has been made of plants of all the varieties of rice grown in Moçambique. Many of them comprised two or more distinct forms, while others were synonyms. A list is given of all the varieties collected, showing the number of types comprised in each. The best characters used in varietal descriptions are described.

4733 Onozawa, Y.
(On the productivity of glutinous rice strains developed by back crossing).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 261–76. [Japanese].

Some high-yielding glutinous strains have been obtained after three generations of back crossing of the hybrid Norin 29 [Ministry of Agriculture and Forestry 29] nonglutinous rice x Saitama 10 glutinous rice.

4734 **Abstract bibliography of rice. 1926–1940.**
College, Laguna, Philippines 1960 : Pp. 182. (Mimeographed).

This further abstract bibliography [cf. 474] contains 554 entries. As before, genetics, cytology and varieties are among the topics covered.

4735 Misro, B., Seetharaman, R. & Richharia, R. H.
Studies on world genetic stock of rice (*Oryza sativa* L.)—II. Awning.
Indian J. Genet. 1961 : **21** : 34–37.

An examination of types collected from the Jeypore Tract at the Central Rice Research Institute, Cuttack, India, showed that the frequencies of awned, tipped and awnless types were respectively 10·5, 3·4 and 86·1%. The corresponding frequencies in the world genetic stock maintained at the institute were 4·3, 7·9 and 87·8% in the case of types from latitude 23½° N to 23½° S, and 7·1, 7·5 and 85·4% in the case of entries from 23½° N to 40° N and from 23½° S to 40° S. Awning tends to be associated with such characters as general vigour and hardiness. It is suggested that mutation for the awnless condition arose at an early stage in the evolution of rice. The predominance of tipped types among cultivated rice varieties is interpreted as signifying that in these types a physiological balance has been attained between the general hardiness and other advantageous characters associated with awning, on the one hand, and certain desirable features of the awnless types. It is further suggested that awning is controlled by one or more major genes and a polygenic system, the continuous variation so commonly observed in populations segregating for awning thus being explicable.

4736 Sampath, S. & Seshu, D. V.
Genetics of photoperiod response in rice.
Indian J. Genet. 1961 : **21** : 38–42.

In these investigations at the Central Rice Research Institute, Cuttack, India, the photoperiodically-insensitive and short-duration *japonica* varieties Gaisen glutinous rice, Fukoku and Zuihio and several short-day, long-duration *indica* varieties were the chief parents. In crosses of Fukoku with *indica* varieties and in a single cross of Gaisen glutinous with an *indica* variety, insensitive photoperiodic reaction was apparently dominant, the F_2 ratio being 3 : 1 or 15 : 1. In hybrids of Zuihio with *indica* varieties, however, insensitivity behaved in a recessive manner. F_1 Fukoku x *Oryza perennis* var. *balunga* was photoperiodically insensitve, the reaction of the cultivated rice thus appearing to be dominant over that of the wild species. It is suggested that in this cross and in the others, genes modifying photoperiodic reaction, through their influence on response to temperature, were segregating. In this connexion it is noted that in Japan Zuihio has been classed as sensitive to photoperiod and Fukoku is considered to be highly sensitive to temperature.

4737 Nagai, I., Suzushino, G. & Suzuki, Y.
Anthoxanthins and anthocyanins in the Oryzaceae, I. and II.
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 247–60.

In the first paper, the results of paper-chromatographic analysis of the anthoxanthins and anthocyanins in the various plant parts of cultivated varieties of rice and of several wild species of *Oryza* are reported. Relevant biogenetic problems are discussed in the second paper.

4738 Mohamed, A. H. & Mallah, G. S.
The application of the method of maximum likelihood to linkage data in cultivated rice.
Alexandria J. agric. Res. 1960 : **8** : No. 2 : 1–8.

The cross-over values reported in a separate paper [4739] were obtained by the product method. In this paper, these values are recalculated by the maximum likelihood method. Concordant results were usually obtained. The reasons for the discrepancies are briefly discussed.

4739 Mohamed, A. H., Mallah, G. S. & Hanna, A. S.
Linkage studies between some morphological characters in rice.
Alexandria J. agric. Res. 1960 : **8** : 9–22.

On the basis of F_2 data from American 3 x American 37 and American 3 x American 41, linkages of genes for long *v.* short second leaf, broad *v.* narrow second leaf, short *v.* fully exserted panicles and broad *v.* narrow flag leaf are reported.

4740 Richharia, R. H. & Misro, B.
The *japonica* x *indica* hybridization project in rice an attempt for increased rice production.
J. biol. Sci., Bombay 1959 : **2** : 35–47.

Two projects have been in progress during the past decade at the Central Rice Research Institute, Cuttack, India: (1) the scheme sponsored by FAO, in which 96 *indica* types from nine countries in south and south-east Asia were crossed with eight *japonica* types from Japan, and (2) the scheme sponsored by the Indian Council of Agricultural Research, in which 97 *indica* types from different parts of India were crossed with eight *japonica* varieties. The authors survey the results so far obtained, difficulties encountered and future lines of investigation. After outlining the breeding techniques used and international participation in the work, they report observations made at Cuttack, with particular reference to hybrid vigour, spikelet fertility and transgressive segregation. Reports received from the Indian States and other Asiatic countries, concerning the performance of hybrid selections, are then commented upon. The following reasons are given to account for the fact that, in general, the results of the tests have not been encouraging, with the notable exception of Malaya. (1) The occurrence of an appreciable amount of spikelet sterility in the F_1 may have resulted in the elimination of useful zygotes. (2) At Cuttack and many other centres, the segregating material was grown in the main-crop season (June–December). *Japonica* varieties give an unsatisfactory performance in this season, being much better in the second-crop season (December–April). *Japonica* characters were therefore probably not fully expressed, valuable material thus being eliminated. (3) In many trials, soil fertility was insufficient for the expression of the responsiveness of *japonica* parents to high amounts of fertilizer. (4) Because of the prevalence of a high degree of spikelet sterility, accurate evaluation of yield potential of the selections was not possible in the earlier generations. (5) In selecting for earliness and short stature, some useful high-yielding genotypes may have been eliminated on account of their being late and very tall. (6) The number of trained personnel dealing with the segregating material may have been inadequate in some cases. In addition, it is noted that, in many Indian States, homozygosity was not attained to any appreciable degree in some selections, even in the F_9. In the absence of yield as the criterion of selection in the F_1, on account of sterility, vegetative vigour has been the logical guide, heterozygous plants thus being unconsciously selected, with the result that attainment of homozygosity may be postponed. Among the lines of work initiated to overcome these difficulties are the following. To reduce sterility in the early generations, the dose of the *japonica* genome is to be reduced by making appropriate multiple crosses. Treatment of *japonica* x *indica* material with mutagenic and polyploidizing agents may prove to be a useful supplementary step.

4741 Richharia, R. H. & Seshu, D. V.
Cytogenetics of an interspecific hybrid in *Oryza*.
Curr. Sci. 1961 : **30** : 189–90.

A triploid hybrid obtained at the Central Rice Research Institute, Cuttack, India, from *O. alta* ($2n = 48$) ♀ x *O. officinalis* ($2n = 24$) ♂ is described. The green colour of the nodal margins which characterizes *O. alta* was dominant to the purple colour of *O. officinalis*. While auricle colour is purple in *O. alta* and faintly purple in *O. officinalis*, the hybrids have green auricles. The hybrids were closer to *O. alta* in plant height, leaf width, spikelet length and awn length. Pollen sterility was very high (96%) and no seed was set. At meiosis, 12 bivalents and 12 univalents were observed regularly, indicating that one of the *O. alta* genomes is homologous with that of *O. officinalis*.

4742 Kamata, K. & Kishimoto, O.
(On the effects of gibberellin on stem elongation in dwarf rice types).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : p. 204. [Japanese].

The effects of a 10 p.p.m. solution on a series of spontaneous and artificially induced dwarf mutants was investigated. The response varied from nil to greatly in excess of that of the control varieties.

4743 Yamaguchi, H.
(On methods for estimating mutation frequency in mutation breeding).
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 53–58. [Japanese].

Three methods for estimating induced mutation frequency in rice are discussed: (1) without correction for progeny sizes; (2) using ears with >25 grains; and (3) applying the formula $M = \sum_n \frac{r_n}{1-(1-p)^n}$, where M is the expected number of mutations, P, the segregation ratio of mutants in each mutant-segregating strain from ears with <25 grains, n, the number of plants in the strain, and r_n, the observed number of mutations.

4744 Matsuo, T. & Onozawa, Y.
(Studies on the induction of mutation in rice by radiation and chemicals. I. The effects of radiation, chemicals and combinations of these on growth and induction of mutation in rice).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 223–27. [Japanese].

The effects of X rays (25 kr.), thermal neutrons ($3{\cdot}9 \times 10^{13}$ nth/cm^2.), colchicine, β-propiolactone and diepoxybutane were studied alone and in various combinations of irradiation and chemical. The highest frequency of chlorophyll mutations resulted from combinations of X rays with the chemicals. The chlorophyll mutation spectrum was not affected by combining irradiation with chemical treatment.

4745 Yamagata, H. & Syakudo [Shakudo], K.
(Studies on the usefulness of artificially induced mutation in breeding. I. On the sensitivity of rice to γ rays and visible mutants in the X_2).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 153–62. [Japanese].

Mutants showing alterations in heading date, height, compactness of spike, glume size and pigmentation, awning, fertility and chlorophyll distribution were obtained in the X_2 of Gimbozu [Silver Bonze] subjected to γ irradiation from Co^{60}. Information is provided on the sensitivity to γ irradiation of the above and some other varieties. The best dose for irradiating dry grains was 10 Kr.

4746 Hasanuzzaman Muhammad Shah, Beachell, H. M. & Atkins, I. M.
Morphological and cytological changes in Century Patna 231 and Bluebonnet 50 rice resulting from X-ray thermal neutron irradiation.
Crop Sci. 1961 : **1** : 97–102.

"Morphological and cytological studies of one X_2 (maintained vegetatively) and 20 X_5 lines of Bluebonnet 50 and Century Patna 231 rice varieties obtained from seeds exposed to different dosages of X rays and thermal neutrons revealed a number of interesting and valuable mutant types. These included mutations of leaf size and color, growth habit, plant height and straw strength, panicles, spikelets, flowering habit, and fertility. Some of the short-stature and other plants may have considerable economic value in breeding lodging resistant varieties.

"Cytological studies revealed that one plant was a tetraploid. Most plants studied were diploid but often had abnormal chromosome numbers or association. Univalents, trivalents, and quadrivalents were common but fragments, asynapsis, knot formations, irregular division, bridge formations, and differences in pollen grain size were observed. There was a positive correlation between quadrivalents in P.M.C. and pollen sterility and between pollen and spikelet sterility although there were some unusual exceptions to this."

[Authors' summary].

4747 Matsuo, T. & Nakajima, T.
(Studies on the genetics of heading period in rice. I. The characteristics of some heading-period mutants induced by irradiation.)
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 137–42. [Japanese].

Descriptions are given of 14 mutants induced by X or β irradiation. While slight induced differences in the minimum heading period of the mutants were noted, the principal induced effects were changes in sensitivity to photoperiod. Some changes in plant height, panicle length and number of panicles are also noted.

4748 Matsuo, T., Nakajima, T. & Hirata, A.
(Studies on the genetics of heading period in rice. II. Genetic analysis of X-ray-induced early mutant strains).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 174–78. [Japanese].

The genetics of earliness was studied in crosses involving Norin 8 [Ministry of Agriculture and Forestry 8] and four early mutants. Each mutant appeared to carry a different major recessive gene for earliness. These genes were independent of the recessive gene for sterility under short days of strain M_2 and of the recessive gene for stiff straw of strain M_4.

4749 Hu, C.-H.
(On a mutant involving panicle degeneration that appeared in the progeny raised from X-irradiated rice).
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 19–23. [Japanese].

The mutant, in which the inflorescence is replaced by a tuft of leaves, appeared in the X_3 of the variety Liu-chou investigated in Taiwan.

It appears to be determined by a single recessive gene. Under 10 hr. photoperiods, normal panicles develop.

4750 CAMPOS, F. F. & ESPIRITU, L.
Mutants isolated from X_1 and X_2 generation of rice (*O. sativa*).
Philipp. Agric. 1960 : **44** : 299–307.

Observations are reported on the following aberrants (X_1) obtained from seeds treated with 2–50 kr. of X rays: (1) a plant having some grains with white endosperm and a yellowish hull and the remainder with red endosperm and a dull brownish-yellow hull [cf. XXX, 1581], (2) albinos, (3) plants with purple pigmentation of the stems and bluish-purple grains and (4) dwarfs. In the case of (1), data are also given on the X_2. The red grains gave rise to plants which produced numerous tillers and ripened 20 days later than those from the white grains. The plants from each type of grain bred true for endosperm and hull colour.

4751 **New 100-day rice released in Texas.**
Rice J. 1961 : **64** : No. **2** : p. 31.

The release of the early variety Belle Patna by the Rice-Pasture Experiment Station, Beaumont, Tex., is announced.

4752 NAGAMATSU, T. & SHINJO, C.
(Studies on the classification of the local rices of Okinawa. I. Classification based on morphological and ecological characters).
Ryukyu Daigaku No Kasei Kogaku Bu Gakujutsu Hokuku/Sci. Bull. Div. Agric. Home Econ. Engng. Univ. Ryukyu 1960 : No. 7 : 147–61. [Japanese].

Seventeen local varieties were studied, data being collected on colour, shape and consistency of the grain, awning, phenol reaction, effect of KOH on the endosperm, germination at low temperature, leaf number, length and diameter of stem, length, weight and number of panicles, number of grains and first spikelets per panicle, and heading period. On the basis of phenol reaction, effect of KOH on the endosperm and awning, the varieties could be subdivided into *japonica* and *indica* types, the former subdivided into Japanese, bulu and one other category, and the latter into two categories. It is inferred that rice had been introduced into Okinawa both from Japan and Indonesia. It is noted that the Okinawa rices comprise notably early varieties and tend to have long, thick stems.

4753 NAGAMATSU, T. & SHINJO, C.
(Studies on the classification of the local rices of Okinawa. II. Classification based on sexual affinity).
Ryukyu Daigaku No Kasei Kogaku Bu Gakujutsu Hokuku/Sci. Bull. Div. Agric. Home Econ. Engng. Univ. Ryukyu 1960 : No. 7 : 162–80. [Japanese].

An extensive series of crosses in all directions was made involving the seventeen Okinawa varieties referred to above and Japanese, bulu, aus, boro, tjereh and aman testers. Based on the fertility of the F_1 hybrids, a *japonica* group could be recognized, comprising the Japanese, bulu and aus types and some of the Okinawa varieties, and an *indica* group, comprising the aman, tjereh and boro types and the remainder of the Okinawa varieties. The Okinawa *japonica* varieties could be subdivided, as before, into Japanese, bulu and a third category. The two subgroups of Okinawa *indica* varieties did not coincide with any of the types of *indica* tester used but they showed affinity with aus, boro and tjereh testers.

4754 JENNINGS, P. R.
Historia del cultivo del arroz en Colombia. **(History of rice cultivation in Colombia).**
Agricultura trop. 1961 : **17** : 79–89.

Detailed information is given on the introduction of rice from Spain to Colombia in the 16th century and subsequent introductions from Ecuador and the United States. The Cauca Valley is considered to be the main centre for the distribution of the crop within Colombia; local varieties in many parts of the country are very similar to Guacarí, a variety which was formerly widely cultivated in that region. Mention is made of recent trials at the National Centre of Agronomic Research, Palmira, in which 11 old, local varieties were found to be resistant to white-leaf disease.

4755 HU, C.-H.
(The chromosome complement of *Oryza glaberrima* Steud.).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1960 : No. 30 : 24–29. [Chinese].

A fuller account is given of an investigation already summarized [XXXI, 3011].

4756 SHASTRY, S. V. S. & RAMAIAH, K.
Cytogenetical effects of X-rays, thermal neutrons and β-particles on *Oryza sativa* L.
Indian J. Genet. 1961 : **21** : 43–51.

Seeds of NP130 were treated with X rays

(11–44 kr.), thermal neutrons ($3{\cdot}29 \times 10^{12}$-$4{\cdot}40 \times 10^{12}$ integral flux) and β radiation from S^{35} (3–9 μc. per seed). Observations were recorded on germination, lethality, height and meiosis in the R_1 and on chlorophyll mutants in the R_2. Multivalents were the most frequent aberration noted in meiosis, particularly in the X-irradiated material. The chlorophyll mutants were of two types, *albina* and *xantha*. The highest frequency (42·9%) of *xantha* mutants resulted from treatment with 9 μc. of β rays, and the highest frequency (50%) of *albina* mutants from exposure to 44 kr. of X rays. The significance of the chimeral nature of M_1 plants is discussed in relation to the frequency of M_1 chromosomal aberrations and to the recovery of M_2 mutations.

4757 SHASTRY, S. V. S. & MISRA, R. N.
Pachytene analysis in *japonica-indica* rice hybrids.
Curr. Sci. 1961 : **30** : 70–71.

Diplotene and pachytene chromosomes were examined in three F_1 *japonica* x *indica* hybrids. The occurrence of translocations, as indicated by the presence of quadrivalents, was recorded in 1·5 to 10·3% of the cells examined; their infrequent occurrence is attributed to the smallness of the interchanges and their subterminal location. In one of the hybrids, 31% of the total chromatin length was unpaired at pachytene, and these unpaired lengths are considered to indicate the presence of interchanges. The unpaired segments are termed 'differential' segments and the term 'differential index' is proposed for the percentage of unpaired chromatin. In the present hybrids, an increase in differential index value was associated with a corresponding increase in sterility. It is considered that sterility in *japonica-indica* hybrids is due to the presence of differential segments rather than to the operation of Oka's duplicate fertility genes [cf. XXVIII, 4257].

4758 BOUHARMONT, J.
Méthodes de traitement par la colchicine et caractères induits chez *Oryza*.
(Methods of colchicine treatment and characters induced in *Oryza*).
Agricultura, Louvain 1961 : **9** : 334–82.

Soaking of germinated seeds, root systems of seedlings or the base of tillers of mature plants in various concentrations of colchicine solution for different lengths of time yielded low percentages of polyploids, no one treatment being appreciably more effective than any other. Intervarietal differences in number of polyploids induced were observed. Polyploids were also induced in a number of intravarietal hybrids in *Oryza stapfii* and in *O. sativa* x *O. glaberrima*; the last mentioned has not yet flowered. Compared with the initial diploid, C_1 to C_8 tetraploids of R66 were generally characterized by larger nuclei, cells and pollen grains, more numerous nucleoli, fewer panicles, larger flowers and grains and greater sterility (65–70%). Among other tetraploids mentioned are: some vigorous plants from Bluebonnet; tetraploids with less than 40% sterility from H520–7; a Vary Lava tetraploid with a 1000-grain weight of about 40–70 g.; and C_1 and C_2 lines from intervarietal hybrids, in which selection for increased fertility has resulted in greater vigour and number of flowers per panicle. In 4*n O. stapfii*, vigour and tillering were comparable or superior to that of the diploid.

Diploid true-breeding mutants obtained by treatment of R66 include plants showing changes in colour or dimensions of the leaves, duration of vegetative period, structure of the panicle and flowers and colour of the caryopsis. When crossed with normal R66, a plant mutant for several characters gave an F_1 intermediate in morphology, fertile and with regular meiosis.

4759 YATSUYANAGI, S. & TAKEUCHI, T.
(Ecological studies on rice varieties. IV. Some studies on internode elongation).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1960 : **29** : 82–84. [Japanese].

In continuation of an earlier investigation [XXX, 2718], data were obtained on number and length of internodes in a series of Japanese varieties and on the influence of planting date and maturation period.

4760 ASAKUMA, S. & IWASHITA, T.
(Ecological studies on heading in rice. III. Some experiments on restraint of heading by high temperature).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 334–36. [Japanese].

The effects of shading on heading period and of successive monthly sowing dates (March to July) on heading period and leaf number were ascertained in experiments in Kagoshima prefecture involving 38 varieties [cf. XXIX, 1582].

4761 Noda, A. & Hayashi, J.
(Studies on the coleorhiza of cereals. VII. On coleorhiza hairs in rice).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1960 : **29** : 63–65. [Japanese].

A comparative study of two upland and two irrigated rices showed that, while the root hairs are rather longer in the irrigated rices, the coleorhiza hairs are appreciably longer in the upland varieties.

4762 Noda, A. & Hayashi, Z.
(Studies on the coleorhiza of cereals. VIII. On the coleorhiza of rice seedlings germinated in high salt concentrations).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 225–28. [Japanese].

A comparative test of eight varieties showed that germination rate in 3–4% NaCl solutions was usually higher in salt-resistant varieties. Norin 18 [Ministry of Agriculture and Forestry 18], however, a variety with little salt resistance, germinated more readily than some of the resistant varieties.

4763 Roberts, E. H.
Dormancy of rice seed. I. The distribution of dormancy periods.
J. exp. Bot. 1961 : **12** : 319–29.

Investigations have been undertaken at the West African Rice Research Station, Rokupr, Sierra Leone, with the ultimate aim of developing a practical method of shortening the dormancy period to facilitate breeding. The present paper describes work on three aspects: (1) distribution of dormancy periods among individual seeds of a particular variety, (2) influence of time of harvest on dormancy and (3) varietal differences in dormancy periods. With one exception, all the varieties studied belonged to ssp. *indica*. The results concerning (1) and (2) are discussed with reference to the determination of mean dormancy period of a variety. Contrary to some previous reports, no association was detected among varieties between duration (period from sowing to modal flowering plus 30 days) and mean dormancy period.

4764 Dumlao, R. C., Escuro, P. B. & Parker, M. B.
Dormancy periods of Philippine Seed Board rice varieties.
Philipp. Agric. 1960 : **44** : 211–17.

Tests of 15 lowland and upland rices revealed intervarietal differences in dormancy period. In general, early varieties had a shorter dormancy period than late, a highly significant correlation coefficient of 0·672 being obtained between maturity and dormancy period.

4765 Nagamatsu, T. & Omura, T.
(Cross compatibility between lines derived from intersubspecific hybridization in rice and each of the ecotypes).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 205–08. [Japanese].

Seventeen lines from *japonica* x *indica* crosses previously described [XXIX, 396] were crossed with Japanese, aus, aman, bulu, tjereh and boro ecotypes. On the basis of the grain fertility of the F_1 hybrids, the lines could be divided into two groups: (1) *japonica* types, and (2) intermediate types, as defined by Morinaga and Kuriyama [XXIX, 397].

4766 Nagai, T. & Matano, T.
(Cultivated rice varieties from the viewpoint of root characters. VI. The formation of a ferruginous film and the absorption of three essential elements).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 191–94. [Japanese].

Further to their earlier studies on ferruginous-film formation on rice roots [XXX, 2723–24], the authors report that the amount of ferruginous deposit was correlated with content of N, P and K in all four varieties studied. A method of eliminating the influence of time and growth in studying this correlation is described.

4767 Ebata, M. & Nagato, K.
(Studies on white-cored rice grains. III. The relation between the development of the starch-cell tissue of the endosperm and white core).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1960 : **29** : 93–96. [Japanese].

Further to a previous study of white-cored rice, [XXX, 2728], comparative data are presented on the changes in grain dimensions, changes in cell shape and development of translucence in white-cored and normal varieties. The grains of white-cored varieties develop more vigorously on the ventral side in the early stages than normal forms.

4768 Kurosaka, A.
(Studies on the breeding of rice varieties of the large-grained type. I. On cross compatibility between Japanese and foreign rices).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : p. 203. [Japanese].

Details of seed set are given for crosses between the Italian variety Balilla, the Italian large-grained varieties Arborio and Razza 77 [Race 77], and the Korean varieties Palkwoing and Sunseo as ♀ parents, and various Japanese varieties as pollinators.

4769 Nagato, K., Ebata, M. & Kono, Y.
(Intervarietal differences in the adaptability of rice to early cultivation in as far as grain quality is involved).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 337–40. [Japanese].

Early sowing, which involves higher temperatures during grain maturation than late sowing, tends to cause inadequate carbohydrate content of the grain and thicker aleurone and bran layers. A comparative study of 30 varieties showed that these effects were much more strongly brought out in some varieties than in others.

4770 Lindner, K., Korpáczy, I., Jaschik, S. & Szőke, K.
Der Nährwert der in Ungarn angebauten Reissorten. **(The nutritive value of rice varieties grown in Hungary).**
Qual. Plant Mater. veg. 1961 : **8** : No. 1 : 25–37.

Results of determinations of crude protein content, protein fractions, aminoacid composition of the protein fractions, content of B vitamins and cooking quality are given for 39 varieties.

4771 Morishima, H. & Oka, H.-I.
The pattern of interspecific variation in the genus *Oryza*: its quantitative representation by statistical methods.
Evolution, NY 1960 : **14** : 153–65.

A full account is given of studies already briefly summarized from a less detailed report [cf. 3012].

4772 Richharia, R. H. & Misro, B.
Flood and deep water rices and the future plan of their improvement.
Indian Agric. 1960 : **4** : 135–43.

The fundamental differences between the flood-resistant and deep-water types of rice are indicated. A survey is given of breeding and other work on both types in India and elsewhere. A list is included which provides particulars of the improved varieties of the two types developed in India. It is suggested that deep-water rices have evolved through crossing between *Oryza sativa* and *O. perennis* and back crossing, combined with natural selection of the progenies. The following future lines of improvement are proposed. (1) Selection may be carried out in deep-water areas, where natural hybrids between the two species may occur. (2) Progenies from artificial crosses between these species may be grown under water in tanks, with suitable arrangements for controlling the level of water. (3) Using the technique reported by Otani *et al.*, genetic stocks may be screened for ability to survive submergence, selections being obtained in further rigorous tests in tanks.

4773 Ito, H. & Hayashi, K.
(Proposals for the improvement of varietal maintenance, the management of breeders'-seed farms, and breeding technique based on long-term storage of rice grain).
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 59–64. [Japanese].

Modifications in existing systems of rice breeding and seed production are proposed, making use of present facilities for bulk storage of grain over several years at low temperature.

4774 Nagai, T. & Tanaka, M.
(Cultivated rice varieties from the viewpoint of root characters. V. Phosphorus in the root and resistance to reduction).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1960 : **29** : 57–59. [Japanese].

The phosphorus metabolism of the roots of varieties differing with regard to degree of tolerance of reducing soils was investigated. Tolerance was associated with greater absorption of P^{32} into the root from nutrient solutions, and with higher contents in the root of both inorganic and organic phosphates. [Cf. XXX, 2723–4].

4775 Subodh Kumar Roy
Interaction between rice varieties.
J. Genet. 1960 : **57** : 137–52.

When 36BKBR7 and 498–2ABR8 were grown in alternate rows or in separate halves of a single plot, their joint seed yield was 26% higher than the mean of their yields when grown separately; 498–2ABR8 gave a greater response than 36BKBR7. The interaction is thought to be due to the production by one or both of the varieties of some substance which diffuses through the surrounding water and stimulates seed production by the other; straw yields were not affected. Under conditions of severe flooding the interaction disappears. Preliminary experiments with a number of other varieties suggest that other "symbiotic" pairs exist.

4776 Ormrod, D. P. & Bunter, W. A. (Jun.).
The evaluation of rice varieties for cold water tolerance.
Agron. J. 1961 : **53** : 133–34.

In evaluating seedlings for cold-water tolerance at the Department of Agronomy, University of California, Davis, use was made of a refrigerated chamber with a glass front admitting sufficient sunlight for normal growth. A temperature of 60 ± 2° F. was maintained for 28–30 days from the time of sowing in 4–5 inches of water, covering a 4-inch depth of fumigated pulverized clay. Ten varieties in four replicates were tested at the same time, each replicate being in a fibre-glass container. Immediately at the end of the test, tolerance was assessed on the basis of (*a*) length of the longest leaf and (*b*) survival, expressed as percentages of the data on the control, Caloro. None of the American varieties tested was significantly more tolerant than Caloro. In general, Californian varieties were more tolerant than varieties from the southern part of the USA. Short-grained varieties were more tolerant than long-grained, whereas the reactions of medium-grained varieties ranged from tolerance to a high degree of intolerance. No relationship between tolerance and maturation period was discernible, except that none of the later varieties equalled Caloro (midseason) in leaf length. In testing samples from a world collection, special attention was given to varieties from Japan and countries at higher latitudes. None was significantly superior to Caloro in tolerance, many of the Japanese entries being well below the control. Field trials of the cold-water tolerance of varieties found to be tolerant in the seedling tests are under way. The results indicate that this group can probably be further subdivided for relative tolerance by field tests and that varieties may alter in their relative tolerance as growth proceeds.

4777 Toriyama, K. & Futsuhara, Y.
(Studies on the genetics and selection of cold tolerance in rice. I. Genetical analysis of cold tolerance).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 143–52. [Japanese].

From a study of the F_1–F_4 of the cross Somewake [Variegated] x Aomori 5, cold tolerance, estimated from sterility induced by cold-water (14° C.) irrigation and rescaled by the inverse-sine transformation, was partitioned into *D*, *H* and *E* components. Cold tolerance appeared to be dominant and determined by >7 genes; heritability was relatively high. Linkages between one or other of the effective factors for cold tolerance and (1) *Rp* (glume-colour localization) and (2) *An* (awning) were detected.

4778 Rajagopalan, K.
Screening of rice varieties for resistance to foot-rot disease.
Curr. Sci. 1961 : **30** : 145–46.

In experiments on plants grown in pots containing soil infested with *Gibberella fujikuroi* at the University Botany Laboratory, Madras, six varieties were resistant. Three of these varieties are recently developed *indica* x *japonica* hybrids from Andhra Pradesh. Medium to fine in quality, resistant to lodging, high yielding and short in duration, they may prove to be useful where foot rot is prevalent. The other three varieties are coarse-grained *japonica* types, which may be valuable as resistant parents in crossing.

4779 Takács, F.
A nagyüzemi rizstermesztés tapasztalatai bruzonés esztendőben. **(The full-scale rice production experiments in a year in which blast was prevalent).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **18** : 256–61.

Data on the incidence of blast in six varieties grown in Hungary in 1959 are given. Precoce Allorio [Allorio Early] and line 45 were the most resistant.

4780 Templeton, G. E., Johnston, T. H. & Henry, S. E.
Rice blast.
Rice J. 1961 : **64** : No. **4** : p. 16.

In tests at the Rice Branch Station, Stuttgart, Arkansas, only Gulfrose, Lacrosse and Zenith were resistant to *Piricularia oryzae.* Mature-plant resistance was highly correlated with seedling resistance.

4781 Simon, J.
Komplex bruzone kutatás és rizs rezisztencia nemesítés új módszerekkel. **(Investigations on the blast complex and breeding for resistance in rice by means of new methods).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **18** : 207–25.

Testing and breeding for blast resistance in

Hungary began in 1956, the test material being grown under conditions favourable for blast, such as high N application, and the tissues examined for degree of browning. In a world collection of varieties tested, the following were both resistant and good in quality and agronomic characters: the Hungarian selection Pallagi 73 from the Soviet variety Fehér szkomsz [White Szkomsz], the Rumanian variety Slejaru 45, the Italian variety Ardizzone, the Soviet variety M26, the Chinese variety Cin-szen 5 and the Indian variety Ambemohor 102. In crosses of resistant and susceptible varieties, resistance was generally recessive. When used as ♀ parent, the high-quality susceptible variety Dunghan Shali always transmitted susceptibility; when used as ♂, it occasionally gave rise to resistant lines resembling Dunghan Shali in grain type, e.g. in crosses with line 45 and Agostano. X-ray experiments have yielded X_3 lines of Maratelli which ripen 18, 20 and 23 days earlier than the initial variety.

4782 Simon Kiss, I.
Összefüggés a Dunghan Shali és Linia 45 fajták gyökérzete és a bruzone megbetegedés között. (**The connexion between root production and blast attack in Dunghan Shali and Line 45**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **18** : 262–65.

Total root weight, root weight as a percentage of the shoot and root length were higher in the susceptible rice variety Dunghan Shali than in the resistant line 45 at the tillering stage but the reverse was true by the time heading occurred.

4783 Z. Kiss, E.
Ellenálló és fogékony rizsfajták minőségi analízisének tapasztalatai. (**Experiments on the analysis of quality in resistant and susceptible rice varieties**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **18** : 266–70.

Among 20 Hungarian varieties, hybrids and selections, those resistant to blast were generally poorer in protein than those susceptible, but the new field-resistant selection Örki 3 approached the susceptible variety Dunghan Shali in quality. Among resistant commercial varieties, the best were Dubovskij 129 and Precoce Allorio [Allorio Early] but these do not approach Dunghan Shali in quality.

4784 Podhradszky, J.
Provokatív vizsgálati módszerek rizsfajták *Piricularia*-rezisztenciájának elbírálására. (**Infection methods for the determination of the *Piricularia* resistance of rice varieties**).
Növénytermelés 1961 : **10** : 67–76.

The methods described are: (1) artificial infection in the greenhouse; (2) natural field infection; and (3) artificial field infection under tents.

4785 Okamoto, H., Yamamoto, S., Hamaya, E. & Marks, G. C.
(**On differences between varieties and varietal groups of Japanese and foreign rice in resistance to the damage caused by various organo-mercuric compounds, and on their efficacy for controlling blast**).
Chugoku Nogyo Shikenjo Hokoku/Bull. Chugoku agric. Exp. Sta. 1960 : **4** : 225–82. [Japanese].

An extensive series of Japanese, Ceylonese and other varieties was tested for resistance to the toxic effects of phenyl, tolyl, diphenyl, ethyl and methoxyethyl organo-mercuric compounds used for controlling *Piricularia.* The experiments were carried out in Japan and Ceylon. Resistance to toxicity was not correlated with morphological characteristics nor with degree of injury caused by blast. Varieties undamaged by the organo-mercuric compounds usually showed a negative colour reaction when phenol was applied to the glumes and were resistant to chlorosis caused by low temperature; the converse relationships, however, do not hold. The F_1 progenies from crosses between Norin 8 [Ministry of Agriculture and Forestry 8], resistant to phenyl mercuric acetate, and five susceptible *indica* varieties showed that resistance is recessive.

FORAGE GRASSES

4786 Fabianowicz, M.
Bibliografia polski prac łąkarskich za lata 1945–1956. (**Bibliography of Polish works on meadows during the years 1945–56**).
Biblioteczk. Wiad. Inst. Melior. Użytk. zielon. 1960 : No. 2 : Pp. 217. (Mimeographed).

The bibliography is arranged into various sections and subsections, one of which is devoted to the biology of meadow plants, another to their systematics, another to breeding and another to seed production. There are 1021 titles in all, those in the breeding section comprising entries 909 to 929.

4787 REBISCHUNG, J. & DEMARLY, Y.
Les plantes fourragères. (**Forage crops**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 143–53.

The various stages in the breeding of improved varieties of forage crops are discussed. The main characteristics, including maturity period, of a number of varieties of legume and grass species are described.

4788 MAKUS, A.
Doniesienie o pracach szwedzkiej hodowli roślin pastewnych. (**Report on Swedish work on breeding forage plants**).
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 148–51. (Mimeographed).

This is an abridged version, in Polish, of a report published in German [cf. XXVI, 1381].

4789 IL'KEVIČ, K. N.
(**The question of methods applied in breeding perennial herbage plants**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 74–76. [Russian].

A brief account is given of work in progress in Rumania and of some of the cultivars produced. These include line ICAR–104 [Agricultural Research Institute 104] of *Agropyron pectiniforme*, distinguished by high protein content, low cellulose content and resistance to diseases; with a yield of 40·4 c. of hay per ha., it has outyielded the local population by 5·4%, while its protein content is 16·68–16·73% compared with 12·3–13% in the local population.

4790 KNEEBONE, W. R.
Grass breeding and livestock production.
Econ. Bot. 1960 : **14** : 300–15.

A review is given of the contributions made by grass breeders in the USA and other countries to the improvement of livestock production.

4791 ZIMMERMANN, K. F.
Korrelationen bei Feldversuchen mit mehrjährigen Futterpflanzen. (**Correlations in field trials with perennial forage plants**).
Z. landw. Vers.- UntersuchWes. 1960 : **6** : 429–36.

Experiments were carried out with forage grasses and leguminous plants and in most cases, positive and highly significant correlations were found between the yields of single cuts and the annual crop and between individual annual crops and the total yield of several years. It is concluded that the yielding capacity may be judged from a single cut or the crop of one year.

4792 FRENCH, M. H.
Errores asociados con el uso de pequeñas parcelas de prueba en la evaluación de rendimiento de pastos. (**Errors associated with the use of small test plots for evaluating the yield of grasses**).
Agron. trop., Venezuela 1960 : **10** : 71–76.

Differences in the conditions of temperate and tropical areas are discussed and it is pointed out that plot sizes adequate in temperate zones are not necessarily suitable in Africa and South America. This is illustrated by yield trials of herbage species in Kenya and Venezuela, which showed that errors and coefficients of variation were high, even when plot sizes as large as 12·48 $m.^2$ (in Kenya) and 40 $m.^2$ (in Venezuela) were employed.

4793 FRENCH, M. H. & SANTIAGO RODRÍGUEZ, C.
Variaciones en los rendimientos de diferentes pastos en los trópicos. (**Variations in the yield of different grasses in the tropics**).
Agron. trop., Venezuela 1960 : **10** : 77–86.

An investigation on the productivity of five grass populations, three growing in Venezuela and two in Kenya, provided information on the minimum size of plot required to provide an accurate estimate (coefficient of variation not > 10%) of the yield of a pasture. The required plot sizes vary from 22·3 $m.^2$ in *Chloris gayana* (in Kenya) to 433·3 $m.^2$ in *Cynodon plectostachyus* (in Venezuela).

4794 BEDDOWS, A. R. & EVANS, G.
Breeding quality plants for quality seed.
Agriculture, Lond. 1961 : **68** : 9–12.

The role of the following in the improvement of forage crops in Great Britain is described: (1) the development of new varieties of grasses, legumes, oats and other crops at the Welsh Plant Breeding Station, Aberystwyth, and (2) official variety trials and certification.

4795 SCHMIEDER, M. VON
Die Bedeutung der Futterpflanzenzüchtung. (**The importance of fodder plant breeding**).
Saatgutwirtschaft 1961 : Spec. Ed. : 24–25.

It is pointed out that many promising varieties of forage plants have been bred in Germany but their use is not yet common practice.

Twenty-third Biennial Report of the State Plant Board of Florida, Gainesville for the period July 1, 1958–June 30, 1960 : **2** : Bull. 14 : Pp. 114.

4796 *Condo, J. K. Turfgrass certification program.* (*pp. 41–48*).

Mention is made of Floratine St. Augustine, a new *Stenotaphrum secundatum* variety [cf. XXX, 4020], and Tifway Bermuda, a *Cynodon dactylon* variety.

4797 TARKOWSKI, Cz.
Współczesne metody oceny materiału hodowlanego traw. (**Modern methods of assessing breeding material of grasses**).
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 90–94. (Mimeographed).

Various methods of assessing forage quality described in the literature are referred to and it is emphasized that a true assessment can only be made by considering the results of morphological, anatomical, cytological, chemical and physiological studies.

4798 BOCHNIARZ, J. & KARWOWSKI, M.
Badania nad biologią i fizjologią kwitnienia i owocowania traw. (**Studies on the biology and physiology of flowering and fruiting in grasses**).
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : **17** : 75–89. (Mimeographed).

Studies were made with 14 of the main species grown in Poland and the results, which do not always agree with statements in the literature, are reported for *Alopecurus pratensis*, *Avena flavescens*, *A. elatior*, *Bromus inermis*, *Lolium multiflorum*, *Agrostis alba*, *Dactylis glomerata*, *Festuca pratensis*, *Poa palustris*, *P. pratensis*, *Phleum pratense* and *Cynosurus cristatus*. Data are presented on dates and times of flowering, optimum temperatures and the advantage to be obtained from supplementary pollination.

4799 ITRIA, C. D.
Identificación de las gramíneas de la provincia de La Pampa por sus caracteres vegetativos. (**Identification of the grasses of La Pampa province by their vegetative characteristics**).
Rev. Invest. agríc. B. Aires 1961 : **15** : 5–82.

Details are given of the vegetative characters, time of flowering and adaptation of 114 indigenous and naturalized grasses of La Pampa. Together with a key for the identification of these grasses, drawings made with the aid of a camera lucida of the area around the ligule are provided.

4800 KLIMOVA, A. K.
(**An experiment on introduction of *Poa bulbosa* in the Southeast**).
Učen. Zap. Saratov. Univ. (Sci. Mem. Saratov Univ.) 1959 : **64** : 101–04 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G646 : p. 60. [Russian].

P. bulbosa, comprising xerophytic and mesophytic ecotypes, doubled its hay yield under cultivated conditions. The mesophytes were more productive than the xerophytes under irrigation and in rainfed conditions.

4801 APIRION, D. & ZOHARY, D.
Chlorophyll lethal in natural populations of the orchard grass (*Dactylis glomerata* L.). A case of balanced polymorphism in plants.
Genetics 1961 : **46** : 393–99.

The frequencies of recessive and lethal chlorophyll deficiency were determined in 14 samples of diploid *D. glomerata* ssp. *judaica* collected from 13 localities in Israel. Estimates were made in two ways: (1) heterozygous plants were detected by means of progeny tests, and (2) plants whose heterozygosity had been established were used as natural testers in each locality to determine the proportion of pollen, carrying a gene for albinism, produced in the vicinity. Frequencies of heterozygotes ranged from 4 to 30%, as determined by (1). The general agreement found between the estimates from the two methods suggested that at least within a given locality a single lethal gene was responsible for the albino condition. Populations growing on terra-rossa soils had higher frequencies of a lethal than those occupying rendzina soils. The high frequencies in some habitats are best explained on the assumption of a greater selective value of heterozygotes as compared with normal homozygotes. Apparently balanced polymorphism with regard to the lethality has been established in the populations tested. Adaptive polymorphism involving genes for chlorophyll deficiency may possibly be of general occurrence in cross-pollinated plants.

4802 PEAKE, R. W.
Chinook orchardgrass.
Forage Notes 1961 : **7** : No. 1 : 44–45.

Further information is given on the synthetic variety Chinook [XXX, 1612].

4803 BORRILL, M. & JONES, K.
Hexaploid *Dactylis*.
Nature, Lond. 1961 : **190** : 469–70.

Two populations from Cyrenaica have been found to be hexaploid ($2n = 42$) at the Welsh

Plant Breeding Station, Aberystwyth. Taxonomically they are indistinguishable from *D. glomerata* ssp. *hispanica*. In one of the three plants studied meiotically, bivalents predominated, while another plant was an interchange heterozygote. The hexaploids equalled $2x$ and $4x$ *Dactylis* in pollen fertility. It is suggested that the hexaploids arose by chromosome doubling of triploid hybrids.

4804 Schulz-Schaeffer, J.
Cytological investigations in the genus *Bromus*. III. The cytotaxonomic significance of the satellite chromosomes.
J. Hered. 1960 : **51** : 269–77.

Thirty species belonging to sects. *Bromopsis*, *Bromium* and *Ceratochloa*, and one hybrid (*B. riparius* x *B. inermis*), were compared on the basis of the shape of their satellite (SAT) chromosomes. Chromosome numbers of 42 taxa within the genus have already been reported [XXVI, 3394; XXVII, 4086]. Chromosome numbers have not however been given in the earlier papers for six of the 31 taxa now under consideration. These are *B. pseudodanthoniae* ($2n = 14$), *B. transsilvanicus* ($2n = 56$) and *B. anomalus*, *B. macrostachys*, *B. oxyodon* and *B. tomentellus* with $2n = 28$. The total number of SAT chromosomes now distinguished is 15 (I, II, IIa, III–VII, VIIa, IX–XIV). The distribution of the types is in conformity with the morphological differentiation forming the basis of the recognition of the three sections. Sect. *Ceratochloa* is characterized by types in which the satellited short arms are extremely small, sect. *Bromopsis* by types with very short satellites, and *Bromium* by larger SAT-chromosomes and particularly by XI with a long satellite. Moreover, types specific for each of the three sections and evidently marking basic genomes were found. These were III, XI and IX in sects. *Bromopsis*, *Bromium* and *Ceratochloa*, respectively. Type III occurred in six out of eight species in *Bromopsis*, XI in nine out of 12 species in *Bromium* and IX in eight out of 11 species in *Ceratochloa*. A diagram denoting the similarities and dissimilarities in SAT types among the 31 taxa is provided. Type III was also found in five species in sect. *Bromium*, viz. *B. macrostachys*, *B. commutatus*, *B. secalinus*, *B. oxyodon* and *B. pseudodanthoniae*. These species may therefore be amphiploids between ancestors of sects. *Bromopsis* and *Bromium*. Containing type XI, $8x$ *B. sitchenis* (sect. *Ceratochloa*) may be interpreted as an amphiploid between ancestors of sect. *Bromium* and *Ceratochloa*. On the basis of the number of genomes marked by III, an autoalloploid condition is postulated for *B. transsilvanicus* (IIa, III, III), *B. erectus* (III, III, III and IV), *B. riparius* (I, III, III and IV) and *B. inermis* (I, III and III), belonging to sect. *Bromopsis*. As already suggested [XXVIII, 4086], *B. riparius* may have arisen from a cross between ancestors of *B. inermis* and *B. ciliatus* (IV). The method of elucidating relationships between basic genomes by using SAT-types as indicator chromosomes is considered to be promising in general.

4805 Kaufmann, M. J., Drolsom, P. N. & Nielsen, E. L.
Reaction of smooth bromegrass to seedling pathogens.
Agron. J. 1961 : **53** : 77–80.

In one of the three experiments reported, ten experimental synthetics, ten named varieties and one bulk lot were inoculated as seedlings with pure cultures of *Pythium graminicola* and *Helminthosporium sativum* (*Cochliobolus sativus*) in two tests under greenhouse conditions at the Wisconsin Agricultural Experiment Station. Four synthetics and Saratoga appeared to be more tolerant of both pathogens than the other entries. Heritability estimates, expressed as the ratio of genetic variance to total variance, were 0·28 (on a plot basis) and 0·60 (on a mean basis) for reaction to *C. sativus*, the correlation coefficient for the results from the two tests of the 21 entries being 0·52 (significant at the 0·05 level). The corresponding heritability estimates and r value for reaction to *P. graminicola* were 0·58, 0·85 and 0·77 (significant at the 0·01 level).

4806 Essad, S.
Sur les possibilités évolutives de l'hybridation—*Lolium perenne* L. x *Festuca pratensis* Huds. **(On the evolutionary possibilities of the hybridization *L. perenne* L. x *F. pratensis* Huds.).**
Ann. Génét. 1961 : **2** : 41–46.

F_1 hybrids from *L. perenne* ♀ x *F. pratensis* ♂ were vigorous but ♂ sterile. After a single back cross to *L. perenne*, only a very small proportion of the progeny retained any *Festuca* characters. When back crossed to *F. pratensis*, the progeny resembled the F_1 plants; they were less vigorous and generally less fertile however. It is suggested that gametes of the *Festuca* type may be selectively eliminated, and this is tentatively attributed to incompatibility between the nuclear components of *F. pratensis* and the cytoplasm of *L. perenne*. It is concluded that the introgression potential of these species is of a very low order.

4807 Whittington, W. J. & Hill, J.
Growth studies on natural hybrids between *Lolium perenne* and *Festuca pratensis*.
J. exp. Bot. 1961 : **12** : 330–40.

A report is given of investigations on the vegetative growth of plants of each species and of their natural hybrid grown singly and in competition under various conditions of light and temperature in the greenhouse at the School of Agriculture, University of Nottingham, England. The hybrids were collected from a meadow in Leicestershire. Fourteen of the 18 hybrids used were triploid ($2n = 21$), the remaining four being diploid ($2n = 14$). The main variable studied was change in leaf number with time. The results led to the general conclusion that survival of the sterile hybrids under natural sward conditions may be explained by their recurrent formation, coupled with their possession of growth characters intermediate between those of the parent species. The intermediacy of the hybrids allows them to survive spring grazing more readily than *F. pratensis* and cutting for hay more readily than *L. perenne*.

4808 Cooper, J. P. & Edwards, J. K. R.
The genetic control of leaf development in *Lolium*. I. Assessment of genetic variation.
Heredity 1961 : **16** : 63–82.

In investigations at the Welsh Plant Breeding Station, Aberystwyth, the pattern of leaf and tiller development was analysed in Italian ryegrass (*L. multiflorum*) and *L. perenne* 'Irish' and 'Hunsballe', attempts being made to assess the genetic variation within each of these varieties for such components of total leaf area as leaf size, rate of leaf appearance and tiller number. Italian ryegrass had larger leaves than the two perennial-ryegrass varieties and began to tiller at a lower node, so that it had a larger leaf area and greater dry weight in the seedling stage. No consistent intervarietal disparities were found in rate of leaf production. The repeatability of leaf length, width, size (area) and rate of leaf appearance was estimated from the analysis of components of variance. The genotypic variation for length, width, size and rate of leaf appearance within the perennial ryegrasses was considerable, compared with that found within homozygous lines of the self-fertilizing species *L. remotum* and *L. temulentum*. Heritability of rate of leaf appearance, leaf measurements, tiller number and dry weight per plant and per tiller was calculated from parent/progeny regression and from the analysis of full-sib families. The estimates were indicative of significant additive genetic variation. Furthermore, the variation within each F_1 pointed to considerable heterozygosity of the parents. The positive environmental correlations between nearly all seedling characters suggested common environmental effects on vigour. A negative genetic correlation was however found between leaf size and rate of leaf appearance and between tiller number and dry weight per tiller. Both these negative correlations would decrease the effect of selection for individual components upon total yield. The amount of genetic variation for leaf components is discussed in relation to the past selection of each variety. Finally, the agronomic implications of the results are considered. It is concluded that selection for individual leaf components is not likely to increase dry-matter production in a competitive sward; direct selection for a high optimum leaf-area index may prove to be a more useful approach.

4809 Cooper, J. P.
Changes in fertility and vigour associated with selection for ear emergence in *Lolium*.
Heredity 1960 : **15** : 453–54. (Abst.).

Selection for early and late ear emergence in the perennial ryegrass strains Irish and Kent has resulted in rapid and continued response for six generations [cf. XXX, 2754]. Although the selection differential is similar in both directions, the realized heritability is always higher in the late lines. Both the selection differential and heritability are greater in Kent than in Irish, possibly because of less stringent agronomic selection in the past. The results of "back selection", initiated in each line after the first generation, indicate that considerable potential genetic variation may be carried within four foundation plants. Male and female fertility have declined in all lines by the sixth generation, and in some cases severely reduced the possible selection differential. The variation in fertility both between and within plants has also increased in the lines. Although the mating system employed resulted in slight inbreeding, no regular depression in such criteria of vigour as leaf size, tiller number or dry weight per seedling was detected, nor was there any regular correlated response in these characters.

4810 Fejer, S. O.

Selection for high and low productivity in perennial rye-grass (*Lolium perenne* L.). I. Heritability study of early generations.

NZ J. agric. Res. 1960 : **3** : 764–71.

Selection for high and low productivity was initiated in the diallel-cross progenies and parents used in an earlier study [cf. XXVIII, 3058]. Progress was slow in the second generation, heritability estimates being generally of the same order (5–30%) as those calculated from the preceding generation; this indicates the importance of additive genetic effects in this material. Progress was influenced by inbreeding depression in the sib crosses made and by heterotic effect in the one wide out-cross used; seasonal effects were also noted. In sib-crossed progenies selected for high productivity, tiller number was much higher than was predicted from the earlier estimates, and also higher than in progenies specifically selected for tiller number. Other characters showing correlated responses to selection for herbage productivity were date of ear emergence, seed weight and total seed production.

4811 Tarkowski, Cz.

Badania nad *Festuca rubra* L. (**Investigations on *F. rubra* L.**).

Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 96–101. (Mimeographed).

Collections made from representative parts of Poland were grown together at Poznań. Variation was detected in number of sclerenchyma bundles in the leaf. *F. rubra* var. *arenaria* differed from other varieties in the structure of the leaf and should, it is thought, be recognized as a distinct species. Most forms examined, including those of vars. *arenaria*, *vulgaris*, *planifolia*, *glaucescens*, *juncea* and *nigrescens*, had $2n = 42$; in var. *barbata* forms with $2n = 28$ were found as well as those with $2n = 42$. Data on contents of protein, fat, nitrogen-free extract, fibre and ash are presented for five varieties of ssp. *genuina*, and one of ssp. *fallax* and of ssp. *trichophylla;* the two last had the highest protein contents; fat contents of up to 5·4% were found in var. *glaucescens*.

4812 Skvorcov, A. K.

(***Festuca longifolia* Thuill., a new graminaceous species for the flora of central Russia**).

Bjull. mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1960 : **65** : No. 5 : 75–80. [Russian].

Areas in the European part of Russia in which collections of *F. longifolia* have been made are enumerated. The morphological characters of the species are discussed, with reference to taxonomic problems within the section Ovinae, subsection Intravaginales.

4813 Rauschert, S.

Studien über die Systematik und Verbreitung der thüringischen Sippen der *Festuca ovina* L. s. lat. (**Studies on the systematics and distribution of the Thuringian taxa of *F. ovina* L. s. lat.**).

Feddes Repert. 1960 : **63** : 251–83.

This revision of the subtaxa of the above species deals with the morphology of the taxa recognized, synonymy, chromosome numbers, distribution in Thuringia and elsewhere and ecology.

4814 Starling, J. L.

Cytogenetic study of interspecific hybrids between *Phalaris arundinacea* and *Ph. tuberosa*.

Crop Sci. 1961 : **1** : 107–11.

Cytogenetic studies on *Ph. arundinacea* ♀ x *Ph. tuberosa* var. *stenoptera* ♂ hybrids, colchicine-induced amphiploid derivatives and the parental species are reported. Attempts to hybridize the two species using *Ph. tuberosa* as the ♀ parent proved unsuccessful. The hybrids were found to possess the winter-hardiness characteristics of *Ph. arundinacea*, while morphologically they tended to be intermediate between the parental species. Under greenhouse conditions the hybrids produced anthers which generally failed to dehisce, but under field conditions some viable pollen was shed.

In the parental species, the predominant chromosome association at diacinesis consisted of 14 bivalents, although quadrivalents and univalents were occasionally observed. In certain *Ph. arundinacea* clones, marked stickiness was observed. In the hybrids, the average diakinesis association was $I_{IV} + 11_{II} + 2_{I}$. Stickiness and nondisjunction were occasionally noted. All hybrids showed precocious movement of chromosomes to the poles of cells at metaphase I. There was a higher mean frequency of univalents per pollen mother cell at metaphase than at diacinesis; this suggested desynapsis of previously associated chromosomes. Laggard chromosomes were apparent at both anaphase I and II. Bridges with associated acentric fragments were identified in approximately 14% of anaphase I cells, and in 3·8% of anaphase II cells. Micronuclei occurred in the majority of pollen quartets. Less than 7% of the hybrid pollen grains were considered functional, on the basis of stainability tests. Back crosses with *Ph. tuberosa* provided evidence that essentially the same level of fertility was present in the female gametes.

The predominant diacinesis association in the amphiploid derivatives was of 28_{II}. Anaphase bridges and fragments, as well as precocious metaphase disjunction, suggested that heterogenetic association continued after the doubling of the chromosome number.

A study of pachytene configurations in the parental species indicated that the following structural differences existed: "two inversions, one or more deletions or duplications, and two or more translocations or other multiple homology involving large segments or the entire chromosomes." The implications of these and other observations are discussed; it is suggested that *Ph. arundinacea* and *Ph. tuberosa* differ mainly in 6 of the 14 chromosomes comprising the haploid set.

4815 LORENZO-ANDREU, A. & GARCÍA-SANZ, M. P.

Estudio comparativo de *Phalaris canariensis* L. diploide y tetraploide. I. **(A comparative study of diploid and tetraploid *Ph. canariensis* L. I.).**

An. Estac. exp. Aula Dei 1960 : **6** : 125–35.

Pollen size, seed size and seed weight were significantly greater in colchicine-induced tetraploids as compared with diploids. In contrast, the number of florets and seeds and the percentage seed set were lower in tetraploid plants. A detailed description is provided of the caryotype of *Ph. canariensis*.

4816 MEWISSEN, D. J., DAMBLON, J. & BACQ, Z. M.

Radiosensibilité des graines d'*Andropogon*, issues de terrains uranifère et non-uranifère du Katanga. **(Radiosensitivity of seeds of *Andropogon* obtained from uraniferous and nonuraniferous soils in Katanga).**

Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 331–38.

Sensitivity to X rays was studied in seed samples taken from *A. filifolius* growing on (1) uraniferous soil and (2) nonuraniferous soil of otherwise similar mineral composition. As measured by the effect on germination percentage and length of seedling stems and roots, sensitivity was higher in material from soil lacking uranium. It is stated that similar results were obtained with *A. dummeri*.

4817 CELARIER, R. P., DE WET, J. M. J. & RICHARDSON, W. L.

Species relationships in *Dichanthium*. I. Hybrids between *D. caricosum*, *D. aristatum* and *D. annulatum*.

Phyton, Vicente López 1961 : **16** : 63–67.

"Artificial hybrids between *Dichanthium caricosum* ($2n = 40$) and *D. aristatum* ($2n = 40$) have either $2n = 40$ or $2n = 60$ chromosomes. The tetraploid hybrids are morphologically intermediate between the two parents and are characterized by chromosomes which mostly associate into 20 bivalents. The hexaploid hybrids resemble the female parent more closely in morphological characters. This would seem to indicate that a cytologically unreduced ovum was fertilized by a normal male gamete. These hexaploids produced two types of F_2 plants. The majority are $2n = 60$ and resemble the original hybrid morphologically. The other plants are characterized by morphological variation and $2n = 30 \pm 2$ chromosomes, indicating that the cytological reduced ovum may develop parthenogenetically. Cytological data suggest chromosome homology between *D. caricosum* and *D. aristatum* but the chromosomes may also pair preferentially among haploid genomes of each species. Essentially normal chromosome pairing between *D. caricosum* and *D. annulatum* may be due to autosyndesis."

[Authors' summary].

4818 HIRAYOSHI, I., NISHIKAWA, K. & HAKURA, A.

(Cytogenetical studies on forage plants. VIII. On 3*x* and 4*x* hybrids from *Miscanthus sinensis* var. *condensatus* x *M. sacchariflorus*).

Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1960 : **12** : 82–88. [Japanese].

Morphological and cytological descriptions are given of the above hybrids. Owing to early degeneration of the pollen mother cells, meiosis could not be studied in the triploid. In the tetraploid, meiosis was fairly regular, one or two quadrivalents being formed besides the bivalents. It is assumed that this hybrid has two genomes from each parent and that autosyndesis occurs in each. [Cf. XXXI, 553].

4819 IVANJUK, L. I.

(Varietal studies of sorghum and Sudan grass along the northern Don).

Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 1 : 132–37. [Russian].

An account is given of varietal trials and chemical analyses of many varieties of Sudan grass and sweet sorghum from a collection at the Institute of Plant Industry. Worth mention is the Sudan grass variety Kuban' 58/2, which surpassed the standard Černomorka [Sudan grass from the Black Sea Littoral] in hay yield and quality. The sweet sorghum varieties Jantar' Kubanskij 84/327 [Kuban' Amber 84/327] and Jantar' Černyj 586 [Black Amber 586] combined earliness with high yields and are recommended for all districts along the northern Don. Medovoe Rannee 163 [Early Honey 163] and Jantar' Krasnyj 271/585 [Red Amber 271/585] were highly productive of hay but had longer growth periods than the varieties previously mentioned; they are thought to be useful in the districts further south and east. Medovoe Rannee 163 and several other varieties with succulent stems and a sugar content of 14·7–18·5% are listed.

4820 MUMINOV, H.

(Growing *Sorghum cernuum* in conditions of Kara-Kalpakia).

Bjull. nauč.-teh. Inform. uzbek. nauč.-issled. Inst. Životnovodstv. (Bull. sci.-tech. Inform. Uzbek sci.-res. Inst. Anim. Husband.) 1959 : No. 4 : 11–17 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G639 : p. 59. [Russian].

Gigant Uzbekistana [Uzbekistan Giant] yielded the most green matter in 24-entry trials at the above institute, while Olti Ojlik Samarkandskaja [Samarkand Olti Ojlik] was the most productive of grain.

4821 **Sudax SX 11.**

Forage Notes 1961 : **7** : No. **1** : p. 45.

A cross between a hybrid grain sorghum and Sudan grass, the forage sorghum Sudax SX11 was developed by DeKalb Hybrid Corn Ltd., Chatham, Ont., and is recommended by the Department of Field Husbandry, Ontario Agricultural College, Guelph. It grows 5–8 ft. high, tillers abundantly, regrows after clipping and requires about 110 days from sowing to maturity. In the size and appearance of its grains, the hybrid is similar to grain sorghum.

4822 CRAIGMILES, J. P. & STACY, S. V.

Suhi-1, first hybrid sudangrass released.

Crops & Soils 1961 : **13** : No. **7** : 22–23.

The above late-maturing hybrid has been released by the Georgia Agricultural Experiment Station mainly on account of its high forage yield, long period of productivity and disease and drought resistance. Its parents are *Sorghum sudanense* 'Tift' and a cytoplasmically ♂ sterile line of Rhodesian Sudan grass (*S. arundinaceum*) [cf. XXIX, 1557]. Further breeding is under way with the aim of reducing the prussic-acid content of the hybrid.

4823 CRAIGMILES, J. P.

The development, maintenance, and utilization of cytoplasmic male-sterility for hybrid sudangrass seed production.

Crop Sci. 1961 : **1** : 150–52.

A full account is given of studies which have already been reported [cf. 1470].

4824 KADAMOV, S. K.

(Hybridization of *Sorghum* species).

Bjull. nauč.-teh. Inform. uzbek. nauč.-issled. Inst. Životnovodstv. (Bull. sci.-tech. Inform. Uzbek sci.-res. Inst. Anim. Husband.) 1959 : No. 4 : 3–10 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G581 : p. 56. [Russian].

Gigant Uzbekistana [Uzbekistan Giant] was obtained by crossing *Sorghum cernuum* with *S. technicum* in Uzbekistan. In trials in Georgia, Azerbaijan and Central Asia it gave high yields of green matter.

4825 CASADY, A. J.

Self sterility in johnsongrass, *Sorghum halepense*.

Crop Sci. 1961 : **1** : p. 154.

A number of crosses were effected between a colchicine-induced autotetraploid selection of *S. sudanense* 'Tift' and a self-sterile form of *S. halepense* which was originally found at Hays, Kans., in 1949. The *S. halepense* form proved to be functional as a pistillate and as a staminate parent. There was some evidence to suggest that the gene or genes responsible for self sterility were recessive.

4826 BURGER, A. W., HITTLE, C. N. & GRAFFIS, D. W.

Effect of variety and rate of seeding on the drying rate of Sudangrass herbage for hay.

Agron. J. 1961 : **53** : 198–201.

Herbage of Sudan-grass varieties with thick stems dried more slowly than that of thin-stemmed varieties. Stem diameter depended chiefly on variety and rate of sowing.

4827 MATUMURA [MATSUMURA], M., TAKASE, N. & HIRAYOSHI, I.
(Physiological and ecological studies on the germination of *Digitaria* seed. I. Individual differences in response to germination temperature and in dormancy).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1960 : **12** : 89–96. [Japanese].

Wide variation was found within *D. adscendens* with regard to germinability at constant temperature and germination rate.

4828 NEWELL, L. C. & EBERHART, S. A.
Clone and progeny evaluation in the improvement of switchgrass, *Panicum virgatum* L.
Crop Sci. 1961 : **1** : 117–21.

Approximately 300 *P. virgatum* clones were selected from a group of 100 strains collected in Nebraska and northern Kansas [cf. XXX, 1626]. These clones, which included tall green, medium-tall blue-green and small blue-green types, were evaluated in isolated crossing blocks during 1956–57; during 1957–58, progenies derived from clones selected for superiority in several plant characters were likewise evaluated. The characters studied were seed quality, seed yield, plant height, height of leaves above the ground, rust index, forage quality and total yield.

Clone x year interactions were high but heritability estimates calculated after the necessary adjustments were still sufficiently high to indicate that, in general, ample additive genetic variance exists to ensure the effectiveness of a clonal-selection improvement programme. This conclusion was supported by the close agreement obtained between predicted and observed gains for several characters.

Data are provided on the genotypic and phenotypic correlations between various characters. Plant height, leaf height, seed yield and forage quality were all positively correlated with total yield. On the other hand, forage quality was negatively correlated with several characters, while in the medium-tall blue-green clones seed quality was negatively correlated with all other characters. The implications of these results are discussed.

4829 HEDBERG, I.
Cytotaxonomic studies in *Anthoxanthum odoratum* L. s. lat. I. Morphologic analysis of herbarium species.
Svensk bot. Tidskr. 1961 : **55** : 118–28.

This study of Swedish material revealed no reliable distinction between tetraploid *A. odoratum* and the diploid designated *A. alpinum* by Löve and Löve.

4830 WASILJEW, W. N.
Das System der Gattung *Calamagrostis* Roth. **(The system of the genus *Calamagrostis* Roth).**
Feddes Repert. 1960 : **63** : 229–51.

In this taxonomic revision of the above genus, five subgenera are proposed. These are further subdivided into sections, subsections and series.

4831 LEIGH, J. H.
The relative palatability of various varieties of weeping lovegrass (*Eragrostis curvula* (Schrad) Nees).
J. Brit. Grassl. Soc. 1961 : **16** : 135–40.

On the basis of observations on such characters as leaf morphology and colour, size of inflorescence and general growth habit, 20 varieties of *E. curvula* studied at the Frankenwald Field Research Station, University of the Witwatersrand, Johannesburg, have been grouped into five main types, for which the names curvula, robusta blue, robusta green, robusta intermediate and chloromelas are proposed. Tests of palatability to cattle showed the robusta green, robusta intermediate and robusta blue types to be the most palatable, the chloromelas varieties being intermediate and the curvula varieties the least palatable. Varieties with the highest phosphate and potash contents and with highest moisture percentages tended to be the most palatable. Crude fibre percentage had little bearing on palatability. No relationship was detectable between leaf structure and livestock preference.

4832 DEWEY, D. R.
Hybrids between *Agropyron repens* and *Agropyron desertorum*.
J. Hered. 1961 : **52** : 13–21.

Fifteen putative hybrids of *A. desertorum* ($2n = 28$) and a rhizomatous species, probably *A. repens* or *A. trichophorum*, were studied cytologically at the Utah Agricultural Experiment

Station. Two had $2n = 35$. Their irregular meiosis further indicated that they were in fact hybrids. The remaining 13 plants were identified as *A. repens* ($2n = 42$) on the basis of cytological and morphological data. When *A. repens* and *A. desertorum* were grown in close proximity, nearly 4% of the open-pollinated progeny from *A. repens* were hybrids. A seed set of 14·4% was obtained from *A. repens* ♀ x *A. desertorum* ♂. The hybrid seed, like that of *A. repens*, had poor germination. Most of the hybrids, natural and controlled, were intermediate between the parent species in spike morphology. The hybrids were rhizomatous but much less aggressive than *A. repens*. A difference in size between the chromosomes of the two species permitted their distinction in the hybrids, the smaller chromosomes being contributed by *A. repens*. The most frequent association at diacinesis and metaphase I in the hybrids was $14_{II} + 7_{I}$. Pairing was completely autosyndetic; the 14 *A. desertorum* chromosomes usually formed 7_{II}, while 14 of the 21 *A. repens* chromosomes formed another 7_{II}. *A. desertorum*, *A. repens* and their hybrids are respectively given the genome formulae AAAA, $B_1B_1B_2B_2CC$ and AAB_1B_2C.

4833 Nielsen, E. L.
Cytology, seed-set, and breeding behaviour of the putative intergeneric hybrid, *Agroelymus turneri*.
Amer. J. Bot. 1961 : **48** : 340–44.

On the basis of morphological characters, breeding behaviour and cytological observations, the parentage of *Agroelymus turneri* ($2n = 28$), a highly sterile putative hybrid collected near Fort Saskatchewan, Alba., is considered to be *Agropyron dasystachyum* x *Elymus innovatus*.

4834 Nielsen, E. L. & Nath, J.
Somatic instability in derivatives from *Agroelymus turneri* resembling *Agropyron repens*.
Amer. J. Bot. 1961 : **48** : 345–49.

Chromosome numbers in root-tips of the above plants, assumed to be the result of outcrossing of *Agroelymus turneri* [cf. 4833] with *A. repens*, varied from $2n = 4$ to over 80. Multipolar spindles and multiple nuclei were fairly frequently observed. It is suggested that the irregularities may be attributed to an unbalanced ribonucleoprotein system resulting from the combination of distantly related genomes.

LEGUMINOUS FORAGE PLANTS

4835 Kossowski, M.
Biologiczne podstawy hodowli roślin motylkowych drobnonasiennych. **(The biological basis of breeding small-seeded leguminous plants).**
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 26–45. (Mimeographed).

A review of the literature is presented.

4836 Tomaszewski, Z.
Zagadnienie hodowli roślin pastewnych w województwie olsztyńskim na tle warunków glebowo-klimatycznych. **(Problems of breeding forage plants in the province of Olsztyn in connexion with the local conditions of soil and climate).**
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 17–25. (Mimeographed).

Studies are being made of local ecotypes of winter vetch, field pea, lucerne, clover, and other forage plants, and selections have been made of serradella, lupin and a number of other species.

4837 Rebischung, J. & Demarly, Y.
La certification des semences fourragères. **(The certification of forage seeds).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 253–63.

A detailed account is given of legislation protecting the forage-crop seed industry. Methods used for the identification of varieties of lucerne, red clover, ryegrass, vetch, peas and kidney beans, are described.

4838 Bolton, J. L.
Breeding a variety of alfalfa.
Forage Notes, Ottawa 1961 : **7** : No. 1 : 1–4.

An account is given of breeding for resistance to bacterial wilt and adaptation to Canadian conditions, initiated in 1946. On the basis of polycross-progeny data for forage yield, recovery after cutting and wilt resistance and clonal records for seed yield, 28 clones were chosen for synthetic combinations. Five synthetics, each derived from ten clones, have been developed, certain of the 28 clones being included in more than one synthetic. Syn. 1 contains only plants of Ladak origin. Respectively, Syn. 2, 3, 4 and 5 were compounded with the emphasis on resistance to bacterial wilt, quick recovery after cutting, high forage yield and high seed yield. All five synthetics have shown a high degree of bacterial-wilt resistance. Both on a regional basis and on dry and irrigated land, Syn. 4 has displayed wide adaptation. Compared with Vernal, it is equal or better in forage and seed yields, resistance to stem and leaf diseases and to bacterial wilt, and recovery. Its winter hardiness also appears to be satisfactory; additional data are however required. In the case of the other synthetics, some forage yield has been lost in selecting for other characters. Syn. 5 is however worth further consideration, since it is a good seed yielder and generally better than Vernal in other respects. Tests of specific combining ability of the basic plants in the five synthetics are being made with a view to the possibility of securing better combinations. In the meantime, it is suggested that Syn. 4 should be considered for licensing and naming.

4839 Kossowski, M. & Tarkowski, C.
Lucerna mieszańcowa puławska (*Medicago media* Pers.). Historia hodowli i opis odmiany. [**The lucerne Mieszańcowa Puławska (*M. media* Pers.). The history of its breeding and a description of the variety**].
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 65–74. (Mimeographed).

The variety described was derived from hybrid material from a cross of *M. sativa* 'Provence' x wild *M. falcata*, made for genetical studies by L. Kaznowski in 1919, and a cross made in 1922 by pollinating a plant of the *M. falcata* type selected from American material with pollen of *M. sativa*.

Mieszańcowa Puławska [Puławy Hybrid] is described as possessing a strong system of secondary roots and almost erect stems with a tendency towards lodging; they are filled with soft parenchyma to a degree varying from 34 to 59%, compared with 35–45% in Grimm and 60–70% in Cossack. The leaflets are longer than in other varieties and the proportion of leaves, buds and flowers to stems is good, amounting to 46–54% at the beginning of flowering. The flowers are mostly mauve in colour, there being from 10 to 34 per inflorescence. The pods resemble *M. sativa* in form, the majority having 2–3 spirals; the mature pods are firmly attached to the plant. The seeds are yellowish, with a 1000-seed weight of 1·95–1·97 g. The yield of green matter is good, the mean being 450–500 c. per ha. and the hay produced is tender, appetizing and nutritious, with a protein content of 15·5650% and a fat content of 1·8749%; the plant is winter hardy and begins its growth very early in the spring, giving the first cut by 20–25 May.

4840 Korohoda, J. & Kossowski, M.
Próba zastosowania graficznej metody w pracach hodowlanych roślin pastewnych, motylkowych. (**A test of the application of the graphical method in breeding work with leguminous forage plants**).
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 17 : 112–22. (Mimeographed).

Characters such as number of shoots per plant, length of main stem, number of internodes, number of leaflets and leaf form were analysed by the method of Jentys-Szaferowa [cf. XXIII, 1499] in populations of *Medicago lupulina* from various parts of Poland. They were shown to differ only slightly. The method is thought to be applicable to breeding material only when a small number of samples or a small number of characters are being considered.

4841 Torssell, R. & Bingefors, S.
Svalöfs Tuna lusern—ett första praktiskt resultat av mellansvensk lusernförädling. (**The Svalöf lucerne Tuna—the first practical result of lucerne breeding in central Sweden**).
Sverig. Utsädesfören. Tidskr. 1961 : **71** : 9–40.

Of the different breeding methods employed at the Ultuna branch of the Swedish Seed Association since the early 1920s, the most effective, leading to the production of Tuna [cf. XXIX, 3528] from the Franconian type, has been mass selection based upon systematic natural selection. Details of the performance of Tuna in comparative trials are included.

4842 Kuliev, A. M. & Aslanov, G. D.
(**Taking account of entomophily in producing lucerne cultivars**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 45–47. [Russian].

A single cultivar used as seed parent was grown surrounded by nine cultivars as pollen parents and from the progeny the best hybrids and lines were selected. They have given yields of over 200 c. per ha. of green matter and 70 c. of seed, which is 35–50% above the yield from the standard varieties in Azerbaijan.

Some varieties and hybrids proved specially suitable for pollination by bees since their corolla tube was 0·3–0·5 mm. shorter and 0·2–0·6 mm. wider than that of the standard cultivar AzNIHI–5 [Azerbaijan Cotton Research Institute - 5]. The nectar secreted by a single flower amounted to 0·2–0·3 mg. in the best selections compared with 0·1–0·2 mg. in the standard cultivars; hybrid 2 and line 3/681–3 secreted 2–3 times as much nectar per day as the standard. Bees remain longer on such flowers and visit them more frequently; seed production is consequently favoured.

By studying seed set in paired flowers of different cultivars the most suitable combinations of seed and pollen parents were determined.

4843 LESIŅŠ, K.
Mode of fertilization in relation to breeding methods in alfalfa.
Z. Pflanzenz. 1961 : **45** : 31–54.

Data assembled from published studies by the author and others indicate that self tripping occurs at a relatively high rate in field populations of lucerne; an average figure of 40% is given. In material classified on the basis of degree of self fertility, three-quarters of the plants were of medium or high self fertility. Both self tripping and self fertility are strongly influenced by environmental conditions. A reduction in fertility and vigour was found in plants inbred beyond the S_2 generation. It is considered that the extent of cross fertilization as determined by recessive inbred tester strains may not be accurate because of different rates of deterioration in pollen and ovules respectively in inbred plants. Measurements of cross fertilization using male-sterile plants indicate that a high proportion of seed may originate from self fertilization. From the occurrence of inbreeding-tolerant plants in field populations, it is suggested that this character could be selected for.

4844 HANSON, C. H.
Longevity of pollen and ovaries of alfalfa.
Crop Sci. 1961 : **1** : 114–16.

Tests utilizing the male-sterile clone 20DRC showed that lucerne pollen *in situ* remained viable for 8–15 days. Pollen stored in glass vials and maintained at 68° F. under optimum moisture conditions (20% R.H.) maintained full viability for about 30 days. Storage at sub-freezing temperatures appeared satisfactory for 132 days but after 183 days some loss in viability was noted. Limited data indicated that viability is well preserved for 183 days when pollen was predried at 20% R.H. for 48 hr., vacuum dried, sealed and then stored at either 0° F. or at room temperature.

4845 FRAKES, R. V., DAVIS, R. L. & PATTERSON, F. L.
The breeding behavior of yield and related variables in alfalfa. I. Replicated clonal plants.
Crop Sci. 1961 : **1** : 205–07.

Observations of the effects of the regrowth period on yield and yield components in ten lucerne strains (5 erect, 5 prostrate) showed that, as the length of the regrowth period increased, heritability estimates for plant height increased while those for plant width decreased. Autumn regrowth treatments had a greater effect on heritability estimates for plant width and length of the longest stem than on those for plant height. Data from summer regrowth treatments showed that the characters were also differentially affected by seasonal differences in respect of regrowth period. Variations in plant width and height and the length of the longest stem accounted for over 90% of the variation in dry-matter yield.

4846 FRAKES, R. V., DAVIS, R. L. & PATTERSON, F. L.
The breeding behavior of yield and related variables in alfalfa. II. Associations between characters.
Crop Sci. 1961 : **1** : 207–09.

All possible crosses were made between two erect (P_1 and P_2) and two prostrate (P_6 and P_7) clones. In four of the six F_1 families, the length of the longest stem was more closely associated with yield than was plant width; in the other two families the reverse was true. In all F_2 families, plant width was more closely associated with dry-matter yield than was length of the longest stem or plant height.

"The squared multiple correlation coefficient (R^2) was ·73 for natural plant height, natural plant width, and long stem on dry matter yield ($n = 30$). When the number of stems per plant was added as a fourth variable this same statistic increased to ·93.

"The path-coefficient analysis of correlation coefficients showed natural plant width to be primarily direct in its effect on yield, whereas stem number was primarily indirect in its effect on yield. A large portion of the significant association of height and long stem length on yield was indirect in its effect via width."

4847 FRAKES, R. V., DAVIS, R. L. & PATTERSON, F. L.
The breeding behavior of yield and related variables in alfalfa. III. General and specific combining ability.
Crop Sci. 1961 : **1** : 210–12.

Diallel crosses were made between the parental types used previously [cf. 4846]. A partial regression equation, computed from the plant width, height and length of the longest stem of 165 plants of a single F_2 family from P_1 x P_2, was applied to these same variables in the other families; the equation was shown to give a satisfactory prediction of dry-matter yield per plant. Diallel analysis for general and specific combining ability showed that plant height and length of longest stem were high in general combining ability, plant width and number of stems per plant were low, and dry-matter yield was intermediate; these findings were confirmed by squared parent-offspring correlation coefficients. It is suggested that more emphasis should be placed on gene action of the non-additive type in breeding forage crops.

4848 PERGAMENT, E. & DAVIS, R. L.
Quantitative inheritance of height and yield in alfalfa, *Medicago sativa* L.
Crop Sci. 1961 : **1** : 221–24.

Two lucerne selections, differing in growth habit, height and size of leaves and stems, were crossed reciprocally. The total heritable variances for height and yield in the F_1 and F_2 generations were estimated from regression and variance components and also from mathematical models assuming (1) disomic and (2) tetrasomic inheritance. The tetrasomic model gave a closer approximation than the disomic model to the regression and variance components method. Based on the tetrasomic model and regression and variance components analysis, estimates of total heritable variance ranged from 31·5 to 61·8% for plant height, and from 12·1 to 26·2% for yield. The partitioning of variability in the F_1 and F_2 variances, using the tetrasomic model, indicated that the genetic contribution to variation was primarily due to additive gene action in the case of plant height, and nonadditive effects in the case of yield.

4849 FRAKES, R. V.
The breeding behavior of yield components in alfalfa.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–4167 : 1013–14. (Abst.).

A replicated space-planted clonal nursery consisting of ten genotypes was used to analyse the effects of regrowth period upon estimates of heritability in the broad sense for (1) dry-matter yield per plant, (2) natural width, (3) natural height, (4) length of the longest stem and (5) number of internodes on the longest stem. As the regrowth period increased from 18 to 38 days, the heritability estimate for (3) increased from 91% to 97% whereas the estimates for (2) and (5) decreased from 86% to 56% and from 51% to 25% respectively. Regardless of the regrowth period, the heritability estimate for (1) approached the mean heritability estimate for (2), (3) and (4). Multiple correlation coefficients indicated that variation in (3), (2) and (4) accounted for 87% or more of the variation in (1). A spaced nursery comprising 4 parents, 4 S_1s, 6 F_1s, 6 reciprocal families and 102 F_2s was used for examining the breeding behaviour of yield components. A partial-regression predictive equation, based on (2), (3) and (4), proved to be satisfactory for predicting mean dry-matter yield per plant for different families. These component measurements can be recorded in less time than actual yield of dry matter. Based on entry means, R^2 for (1), (3) and (4) on yield was 0·73. When stem number was added as a fourth variable, R^2 increased to 0·93. Ten of the 12 single crosses were affected by a significant inbreeding depression for (1), as indicated by a multiple-range test for significance. In each case, one or more of the components also showed a significant inbreeding depression. When no such effect was observed for (1), none of the components displayed inbreeding depression. The possible use of broad-sense heritability estimates, together with progenies, to determine the additive and nonadditive portion of the total genetic expression for a given variable was considered. "It was suggested that once genetic components were determined for a given set of variables, the character response in crossing may be predicted within limits from character measurements on the parental types." Path-coefficient analysis of correlation coefficients indicated that stem number was highly associated with (1), but that the association was indirect through leaf and stem weights. Diallel analysis of single crosses and reciprocals revealed that (3) and (4) are affected by general combining ability, and (2) and stem number per plant by specific combining ability. Dry-matter yield was intermediate among these four components as regards general and specific combining ability. These results for combining ability were confirmed by parent-progeny (F_2 on F_1) squared correlation coefficients. Greater progress may be expected if the breeder utilizes techniques taking maximum advantage of both general and specific combining ability.

4850 KONSTANTINOVA, A. M. & TABAČKOVA, JU. N.
(Adaptation of lucerne to acid soils).
Agrobiologija (Agrobiology) 1960 : No. 2 : 251–54. [Russian].

Acid-tolerant lucerne forms developed at the Williams Institute absorbed P and Ca from the soil more actively than other varieties [cf. 2079]. The tolerant forms secreted substances from their roots which reduced the acidity around them and improved the conditions for development of nodular bacteria.

4851 DADAY, H. & GREENHAM, C. G.
Genetic studies on cold hardiness in *Medicago sativa* L.
J. Hered. 1960 : **51** : 249–55.

Hardiness was determined at the Division of Plant Industry, Canberra, Australia, by means of measurements of the electrical resistance of the crown after cold treatment of prehardened plants, earlier investigations having shown the phenotypic correlation between electrical resistance and recovery to be high. Highly significant differences in hardiness, expressed as electrical resistance, were demonstrated between clones of Hunter River, the heritability in a broad sense being 0·53 ± 0·23. Using the electrical-resistance technique, a study of crosses involving Hairy Peruvian, Hunter River, Ladak and Rambler indicated that these varieties differed significantly in general combining ability for hardiness, the F_1s generally being intermediate in hardiness between the two parents. No indication was obtained of non-additive gene action with respect to hardiness. Rambler contributed a high degree of hardiness to its F_1 progenies, in contrast to Hairy Peruvian, which conferred only a low degree. In F_2 African (susceptible) x Rambler (resistant), the correlation coefficient between electrical resistance and winter yield of dry matter was —0·38. The genotypic correlation between these two variables within two varieties (Hunter River and Rambler) was strongly negative. Exposure to a day length of 18 hours instead of to natural light, prior to cold treatment, led to an increase in both winter yield and electric resistance in a mixed population. Although the data on F_2 individuals did not altogether rule out the possibility of securing recombinants with good winter growth and moderate hardiness, the results suggested that selection may be seriously hampered by a negative genotypic correlation between hardiness and winter growth.

4852 SMITH, D.
Association of fall growth habit and winter survival in alfalfa.
Canad. J. Pl. Sci. 1961 : **41** : 244–51.

Growth following cutting in early September and winter survival of populations of first-year plants of 15 varieties were studied at the Wisconsin Agricultural Experiment Station. Varieties with a high degree of winter hardiness produced, during the shortening day lengths and cooler nights of autumn following the cutting, top growth of short over-all height, a high percentage of short plants and a low percentage of very tall plants, the reverse being true for less hardy varieties. Percentage injury during the first winter was highly and significantly correlated with percentage of extra tall plants (+ 0·95), average height of all plants (+ 0·94) and percentage of short plants (—0·81), as measured in the previous autumn. Plants from crosses between extra tall, upright plants of Vernal were uniformly tall and sustained considerable winter injury, while those from crosses between short, spreading plants were uniformly short and suffered very little winter injury. Plants from crosses between parents intermediate in growth type underwent an intermediate degree of winter injury, resembling Vernal in this respect. Estimates of winter loss based on ratings for each plant gave a more precise estimate of intervarietal differences in survival than those based only on number of dead plants.

4853 BORDEWICK, B. E.
Studies on maintenance of virulence of *Corynebacterium insidiosum* (Mc Cull.) H. L. Jens. in culture and the inheritance of resistance to *C. insidiosum* in diploid *Medicago falcata* L.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–4151 : p. 1016. (Abst.).

The genetical part of the investigations showed reaction to *C. insidiosum* to be under the control of multiple genes.

4854 Blair, I. D. & Bennett, A.
***Rhizobium* inoculation of lucerne (*Medicago sativa* L.).**
NZ J. agric. Res. 1960 : **3** : 804–19.

Experiments at Canterbury Agricultural College, Lincoln, New Zealand, demonstrated varietal differences in response to inoculation with different strains of *R. meliloti*.

4855 Schechtner, G.
Einige Erfahrungen mit Luzerne-Herkünften. (**Some experiences with lucerne strains**).
Fortschrittl. Landw., Graz 1960 : **38** : p. 8.

Thirty-six varieties and strains were tested at Piber in Austria. Du Puits was outstanding for its winter hardiness, vigour and resistance to *Stemphylium sarcinaeforme*. Some Hungarian and Austrian lucernes also gave good results.

4856 Oppenheimer, H. R.
Essai d'une révision des trèfles de la Palestine. (**An attempted review of the clovers of Palestine**).
Bull. Soc. bot. Fr. 1961 : **108** : 47–71.

The distribution and morphological variability of Palestinian *Trifolium* spp. are discussed in relation to taxonomic and phytogeographic problems. A total of 38 species are classified, using the system proposed by Bobrov. Within the subgenus *Trifoliastrum* most species are essentially stable in character, but in the section *Galearia* of that subgenus and in the sections *Stenostoma* and *Calycomorphum* of the more recently evolved subgenus *Lagopus*, considerable polymorphism exists. In some cases this may be accompanied by cytological irregularities, as in *T. israeliticum* (*Calycomorphum*), which is reported to have $2n = 12$.

It is pointed out that variability in *Trifolium* in the Levant may be partly attributed to mutations stimulated by the extremes of temperature, light and humidity characteristic of the region. Further, the mountainous areas tend to favour the isolation and stabilization of newly evolved types. Ecological problems are discussed in some detail and the species are classified into five groups on the basis of their natural habitat.

4857 Drapala, W. J. & Hogg, P. G.
Orbit, a new red clover, resists powdery mildew.
Miss. Fm. Res. 1961 : **24** : No. **5** : 1, 5.

Orbit, developed at the Mississippi Agricultural Experiment Station from Kenland Red by six cycles of recurrent mass selection, is superior to other varieties in forage yield in seasons favouring spread of powdery mildew (*Erysiphe polygoni*) and equal to them when mildew is not a problem. It is also better in forage quality at harvest, on account of its finer and more succulent stems and freedom from diseased leaves.

4858 Lebedeva, V. I. & Golubeva, A. A.
(**The overwintering conditions of red clover in the Vologda province**).
Sel'sk. Hozjajstv. sev.-zap. Zon. (Agric. NW Zone) 1959 : No. 10 : 30–34 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G618 : p. 57. [Russian].

Local populations, with a late winter form as the main component, were the most resistant to cold of the populations studied under Vologda conditions. Even under a thin layer of snow the plants survived a temperature of the order of −15° C. around the base of the stem.

4859 Weir, J. B.
A comparison of the nodulation of diploid and tetraploid varieties of red clover inoculated with differen rhizobial strains.
Plant & Soil 1961 : **14** : 85–89.

A comparison was made of three strains of *Rhizobium trifolii* with respect to effectiveness on a diploid red-clover variety and a tetraploid one grown in aseptic mineral-agar culture at the Botany Department, University College of Rhodesia and Nyasaland, Salisbury. With two of the strains, $4x$ plants were slower to nodulate than $2x$, although 100% nodulation was ultimately obtained with each strain in both varieties. With the third strain, the $2x$ and $4x$ varieties had 66% and 8% nodulation, respectively. In general, fewer but larger nodules were formed on $4x$ plants than on $2x$ over a given period. Without exception, the tetraploids exceeded the diploids in fresh weight.

4860 Crowder, L. V. & Echeverri, S.
Response of red clover varieties at high elevations in Colombia.
Agron. J. 1961 : **53** : 201–04.

At the Tibaitatá Experiment Station, situated near Bogotá at an altitude of 8660 ft., varieties from Louisiana (30° N latitude) surpassed other varieties, mostly from other parts of North America, in seedling growth and forage yield at the first harvest. In subsequent harvests, varieties from the so-called red clover belt of the USA (38°–45° N) equalled or exceeded the other entries in forage production. Yields remained low in the case of varieties from latitudes above 50° N. In the swards, varieties from the more northern latitudes produced no, or only a few, flowering stems, whereas those from the southern latitudes developed more flowering stems and greater numbers of flowers. In spaced plantings, the expression of growth types, as based on flowering response, was related to the area of varietal development and to the region of seed production. The plant types did not change from year to year. For most of the double-cut varieties, the 12½-normal day length in Colombia was adequate for a valid differentiation into growth types. For most of the single-cut varieties, a longer photoperiod will probably be required for such a classification. A shift in growth type within a variety was noted when the seed had been produced in a region different from that in which the variety had been developed.

4861 BARBACKI, S.
Certain physiological properties of tetraploid and diploid forms of clover (*Trifolium*) and serradella (*Ornithopus sativus*) compared on the basis of water rationing pot experiments.
Genet. polon. 1960 : **1** : 175–82.

Under both drought and high moisture conditions, tetraploid red and Alsike clovers outyielded the corresponding diploids, tetraploid serradella yielded about the same as the diploid, while tetraploid white clover was outyielded by the diploid.

4862 SCHECHTNER, G.
Winterhärte und Ausdauer einiger Rotkleesorten. (**Winter hardiness and persistence of some red clover varieties).**
Förderungsdienst 1960 : **8** : No. 4 : 1–7.

Twenty eight varieties were tested in alpine districts. The early varieties, Leisi, CB, Violetta, Essi, Resistant Øtofte III and Kuhn showed good winter hardiness and a satisfactory proportion survived until the autumn following the first winter; other varieties which were only tested in some of the trials also gave good results. Leisi and Gumpenstein showed a good percentage survival in the autumn following the second winter and are therefore suitable for two-year cultivation. The late varieties were on the whole more hardy in the first winter than the early types but did not survive so well in the next year and are not suitable for two-year cultivation.

4863 HANSON, E. W. & HAGEDORN, D. J.
Viruses of red clover in Wisconsin.
Agron. J. 1961 : **53** : 63–67.

This paper includes information on the reactions of ten red-clover varieties to four of the six viruses identified. The varieties differed in susceptibility to each of the viruses inciting red-clover vein mosaic, bean yellow mosaic, Wisconsin pea streak and lucerne mosaic, as well as in the kind of symptoms produced. Some varieties showed a high degree of resistance to one or more of the viruses.

4864 VINOGRADOVA, E. V.
(Red clover varieties in conditions of the central inundated area).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 57–58. [Russian].

The survival of commercial varieties and wild forms of red clover under conditions of prolonged flooding (24–30 days) was investigated at the Dedinovo Experiment Station, Moscow district. The outstanding varieties, in terms of percentage survival, were as follows: Dedinovo, a selection from a local wild form; Lenskij and Pižemskij, two northern wild forms; and Habarovsk, a late-flowering variety. A number of hybrid lines developed at Dedinovo showed promising resistance to flooding.

4865 SYMON, D. E.
A bibliography of subterranean clover together with a descriptive introduction.
Mimeogr. Publ. Commonw. Bur. Past. Field Crops 1961 : No. 1 : Pp. 122. (Mimeographed).

The bibliography covers the period 1650 to mid-1960 and all references other than some of the records listed in floras. A brief account of the history and of the botanical, ecological and agronomic characters of the crop precedes the bibliography. This introduction includes a short section on breeding and genetics.

4866 NUTMAN, P. S.
Variation in symbiotic effectiveness in subterranean clover (*Trifolium subterraneum* L.).
Aust. J. agric. Res. 1961 : **12** : 212–26.

A detailed report is given of investigations begun at the Division of Plant Industry, CSIRO, Canberra, Australia, and completed at the Rothamsted Experimental Station, England [cf. 157].

4867 **Carnamah.**
Rur. Res. CSIRO 1961 : No. 35 : 18–19.

An account is given of the origin of the very early-flowering subterranean clover Carnamah and of its performance in spaced plantings in

Australia [3494]. Preliminary results from sward trials of Carnamah are encouraging.

4868 YAMAMOTO, K.
[On various characteristics of hybrids between a Moroccan strain of *Vicia sativa* ($2n = 10$) and the common strain ($2n = 12$)].
Kagawa Daigaku Nogakubu Gakujutsu Hokoku/Tech. Bull. Fac. Agric. Kagawa Univ. 1959 : **11** : 28–37. [Japanese].

Morphological and cytological descriptions are given of the F_1–F_3. In the F_1, the most frequent meiotic configurations were $5_{II} + 1_I$ and $1_{III} + 4_{II}$. In the F_2, strains with 10, 11, 12 and 16 somatic chromosomes segregated. In the F_3, the strains with 10 and 12 chromosomes bred true. The 11-chromosome plants again segregated.

4869 MORIYA, A.
Hybrid vetch obtained by species crossing between common and Japanese wild vetches.
Crop Sci. 1961 : **1** : 229–30.

Three vigorous, *Colletotrichum*-resistant hybrids which give high seed and fodder yields have been selected from *Vicia angustifolia* var. *segetalis* f. *normalis* ♀ x *V. sativa* ♂; both these species have $n = 6$. Pollen fertility increased from 4·5–30·2% in the F_1 generation to 92·4–96·2% in the F_3. Segregation data, obtained from very small populations, are given for various morphological characters. The cross was made at the College of Agriculture, Utsunomiya University, Japan.

4870 METTIN, D.
Über das Wesen des angeblichen Linsen-Wicken-Bastards. (**On the nature of the putative lentil-vetch hybrid**).
Biol. Zbl. 1960 : **79** : 701–18.

The supposed hybrid between *Lens culinaris* and *Vicia sativa*, discovered in 1828, has lentil-like seeds but otherwise is more like vetch. Crosses between vetch and lentil and between the "hybrid" and lentil failed, but crosses of the "hybrid" with vetch were successful, giving clear-cut segregation ratios for the characters studied. Flat seeds (*plat*) were monogenically recessive to round seeds; orange cotyledon colour (*aur*) was monogenically recessive to yellow; testa colour showed dihybrid segregation; and resistance to shedding was monogenically recessive to susceptibility. The chromosomes of the "hybrid" and vetch were identical, while those of lentil were quite different. It is concluded that the "hybrid" arose as a spontaneous mutant of vetch.

4871 DONNELLY, E. D. & HAYS, S. B.
Warrior—a bruchid-resistant vetch.
Leafl. Ala. agric. Exp. Sta. 1961 : No. 65 : unpaginated.

Attention is drawn to the resistance of *Vicia sativa* 'Warrior' to *Bruchus brachialis* [cf. XXX, 1666].

4872 ROUSI, A.
Cytotaxonomical studies on *Vicia cracca* L. and *V. tenuifolia* Roth. I. Chromosome numbers and karyotype evolution.
Hereditas, Lund 1961 : **47** : 81–110.

The number and morphology of the somatic chromosomes were examined in 73 samples of *V. cracca* and 14 samples of *V. tenuifolia*. In *V. cracca*, three chromosome races were found with $2n = 12$, 14 and 28 respectively. All strains of *V. tenuifolia* had 24 chromosomes. Occasional aneuploids occurred in both species, but some 13-chromosome seedlings which occurred in a 12-chromosome sample of *V. cracca* were considered to be hybrids between this and a 14-chromosome strain of the same species; the hybrids were albinos and died a few weeks after germination.

In Europe, the polyploids have a more northerly distribution than the diploids. In the case of *V. cracca*, the distribution of 14 and 28-chromosome races appears to be largely determined by the limits of the Pleistocene glaciation. The greater colonizing ability of the 28-chromosome race is confirmed by the fact that this is the only race which has been introduced into North America and New Zealand. In Asia, the 14-chromosome race extends farther north than in Europe but appears, from the limited material available, to occur close to nonglaciated regions; the 28-chromosome race was not represented in the Asiatic material examined.

Caryotypic studies suggest that the 14-chromosome race is the most primitive and that the 12-chromosome race was derived from it by a translocation of the centric-fusion type. The 28-chromosome race probably evolved by polyploidization, although no definite evidence about the type of polyploidy was obtained. *V. tenuifolia* is thought to have evolved from the 12-chromosome race of *V. cracca* or from some closely related 12-chromosome form.

4873 MIROŠNIČENKO, L. P.
(Biology of wild forage vetches under cultural conditions).
Ukrajin bot. Ž. (Ukrain. J. Bot.) 1960 : **17** : No. 2 : 43–49. [Ukrainian].

Vicia atropurpurea, *V. calcarata*, *V. hyrcanica*, *V. ervilia*, *V. monanthos*, *V. dasycarpa*, *V. sativa* var. *ludoviciana*, *V. pannonica* and *V. narbonensis* showed promise as new forage plants in introduction trials at Sinel'nikovo. Other species tested have no value for direct introduction, as some of their economic characteristics require improvement by breeding.

4874 VASILEVA, M.
(Changes in the spring vetch 20 effected by the action of low temperatures at the end of the vernalization period).
CR Acad. bulg. Sci. 1960 : **13** : 95–98 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. **3** : Abst. 612 : p. 41. [Russian]. (Mimeographed).

Seeds of this vetch were subjected to a temperature of −5° C. for 5 or 10 days towards the end of the vernalization period; from the resulting plants seed was gathered and sown in autumn. The next generation showed marked differences in morphological, physiological and biochemical characters; for example the plants had a prostrate habit and anthocyanin shading on the stem. The overwintering capacity was closely related to the morphological changes and the plants which had received 5 days cold treatment were most winter hardy. These plants had more concentrated cell sap than the spring vetch and the winter standard and a greater content of sugar.

4875 KEL', M. I.
(Expanding areas under valuable varieties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 2 : 16–17. [Russian].

Mention is made of a local sainfoin variety, Bessonovka, which is highly productive of hay and seed in the Belgorod province.

4876 JARANOWSKI, J. K.
Semisterility in the interspecific hybrid *Melilotus polonica* x *M. alba*.
Amer. J. Bot. 1961 : **48** : 28–34.

F_1 hybrids of *M. polonica* ($2n = 16$) x *M. alba* ($2n = 16$) were morphologically intermediate between the parent species and had 46·8–72·6% pollen sterility, with a mean value of 58·8%. At diacinesis and metaphase I in the PMCs, 6_{II} + a chain or ring of 4 chromosomes were observed. A cross-shaped configuration characteristic of a reciprocal translocation was seen at pachytene, indicating that one of the parents was homozygous for an interchange between relatively large segments of two chromosomes. Bridges, laggards, movement of two univalents to the same pole and precocious division of one of the univalents resulted in irregular chromosome distribution at telophase I. Irregularities in chromosome distribution were also noted in some anaphase-II configurations. Reduction in self fertility indicated a corresponding aberrant distribution during megasporogenesis. Meiotic irregularities in the F_2 were comparable to those in the F_1. Two F_2 plants had relatively low pollen sterility (24·4 and 34·5%); they proved to be aneuploids ($2n + 1$). Leaving aside these two plants, the mean percentage of pollen sterility in the F_2 was 57·9.

4877 **Denta, new nonbitter sweetclover variety.**
Crops & Soils 1961 : **13** : No. 7 : p. 22.

Denta, the first nonbitter sweet-clover variety to be bred in the USA, contains only one-twentieth of the coumarin present in other varieties. The starting-point of its development was a cross involving a wild species (unspecified). The variety is well adapted in the northern Great Plains and western part of the Corn Belt.

4878 SCHAEFFER, G. W., GORZ, H. J. & HASKINS, F. A.
Genetic, developmental, and within-plant variation in free and bound coumarin content of sweetclover.
Crop Sci. 1961 : **1** : 194–96.

The data relate to Evergreen (phenotype *CuB*), W7 (*Cub*) and W31 (*cu*⁻). In an addendum it is stated that "work done by the second and third authors subsequent to the submission of the manuscript indicates that intact sweet-clover plants contain little if any free coumarin." "The free coumarin values given in the present paper provide an indication of the magnitude of enzymatic hydrolysis of bound coumarin during the extraction procedure, but the accuracy with which these values reflect levels of free coumarin in the plant are now in doubt." The total-coumarin values given, however, are not invalidated by the later findings.

4879 Sortsforsøg med Lupiner 1956–60.
(Varietal trial of lupins, 1956–60).
Tidsskr. Frøavl 1961 : **25** : 163–65.

Data on yields of green matter, dry matter, seeds and protein are given for varieties and strains tested at four stations in Denmark.

4880 KAZIMIERSKI, T.
An interspecific hybrid in the genus *Lupinus* (*Lupinus albus* L. x *Lupinus jugoslavicus* Kazim. et Now.).
Genet. polon. 1960 : **1** : 3–60.

At the Institute of Genetics and Plant Breeding in Poznań, interspecific hybrids were obtained using *L. albus* 'Biały III' [White III], 'Biały V' and 'Biały Czechnicki' [Czechnica White] as female parents in crosses with *L. jugoslavicus*; no seeds were obtained from reciprocal crosses. Both species had $2n = 50$.

In the F_1, the following characters were intermediate between those of the parents: leaf size, pod size, hypocotyl length, seed size, growth rate and length of growing season. Characters showing dominance of paternal genes included dense pubescence of plants, colour of flowers, pods, seeds and leaves, and the formation of a rosette of leaves just above ground level during the first phase of growth. In the F_2 and F_3 populations, variability was great and in the case of seed size, flower colour and maturity, extended beyond the range of parental variability. Floral abnormalities occurred in certain individuals. Long hypocotyl was positively correlated with earliness.

The dark-green leaf colour of *L. jugoslavicus* was conditioned by a single dominant gene. Leaf shape is conditioned in each species by a single gene designated *elongate* in *L. albus* and *ellipsoid* in *L. jugoslavicus*. Flower colour appeared to be conditioned by one factor in Biały III and Biały Czechnicki (A_1A_1), two in Biały V ($A_1A_1A_2A_2$) and three in *L. jugoslavicus* (A_1A_1-A_2A_2DD). Gene A_2 intensifies the blue colour produced by A_1 while D produces a violet colour. White seed in *L. albus* is controlled by two recessive genes alb_1 and alb_2 while the marbled dark-brown seed colour of *L. jugoslavicus* is conditioned by the dominant genes Alb_1 and Alb_2. Low alkaloid content in Biały III and V is conditioned by a single recessive gene. Hardness of the seed in *L. jugoslavicus* is a dominant character and appears to be controlled by several factors.

From the occurrence of certain individuals which resemble *L. graecus* and *L. termis*, particularly in seed characters, it is suggested that *L. albus* may have evolved along either of two paths: *L. jugoslavicus* → *L. graecus* → *L. termis* → *L. albus*; or *L. jugoslavicus* →

$$\begin{tikzcd} & L.\ termis \\ L.\ graecus \arrow[ur] \arrow[dr] & \\ & L.\ albus \end{tikzcd}$$

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4881 Barbacki, S. & Kapsa, E.
Variability in *Lupinus albus*.
Genet. polon. 1960 : **1** : 61–101.

Morphological, physiological and chemical variability was studied in six low-alkaloid strains selected from local material at the Experimental Station at Przebędowo near Poznań; these are Biały [White] strains I to VI. Great variability was found in all the strains and it is considered that the material offers good possibilities for the selection of high-yielding, early-maturing lines suitable for growing in Poland.

4882 Forbes, I. & Burton, G. W.
Blanco blue lupine.
Ga. agric. Res. 1960 : **2** : No. 2 : p. 3.

The sweet blue lupin Blanco (WFB x Borre) is adapted for late-winter grazing in southern Georgia and northern Florida. It has the marker characters of white flowers, white seeds, and bright-green stems and leaves without any purple pigment, all inherited from WFB. Its sweetness depends upon the recessive gene *iucundus*, derived from Borre, and lack of anthocyanin upon a pair of recessive genes. Blanco is equal to Borre in forage yield, protein content, freedom from alkaloids, palatability to cattle, seed softness and reaction to freezing, diseases and insects.

4883 Majsurjan, N. A. & Ėdel'štejn, M. M.
(Composition of the alkaloids of cultivated and wild lupin species).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 8 : 64–72. [Russian]

The alkaloids were examined in 16 species by paper chromatography. The data presented show that *Lupinus hybridus* has the highest alkaloid content, with 3·30%, and *L. nanus* the lowest, with 0·48%.

The species differed also in the proportion of the various alkaloids they contained. Among the Mediterranean species the highest proportions of the more toxic alkaloids such as lupanin and lupinin were found in *L. angustifolius* and *L. luteus*; much lower proportions were found in *L. albus*, which has been cultivated for many centuries, and the least of all in *L. pilosus*. Most American species contained little or no lupinin but high proportions of lupanin and spartein were found in *L. polyphyllus*, *L. elegans* and *L. ornatus*. Again the lowest proportions of toxic alkaloids were found in species such as *L. mutabilis* which have long been an object of cultivation. *L. hybridus*, thought to be a hybrid of *L. mutabilis* x *L. ornatus*, was intermediate between these two in its alkaloid composition. Certain species such as *L. insignis* and *L. hartwegii* are considered promising because they contain a low proportion of toxic alkaloids and a high proportion of nontoxic ones of unknown composition, which may, it is suggested, confer a greater resistance to pests and diseases than is possessed by the existing sweet lupins.

4884 PRZYBYLSKA, J.
Forms of organic nitrogen and their changeability in certain species and varieties of lupin.
Genet. polon. 1960 : **1** : 145–73.

Within *Lupinus angustifolius*, *L. albus* and *L. luteus*, varietal differences in free arginine content were noted. Seeds of low-alkaloid forms contained more free arginine than those of bitter forms; this relationship was particularly marked in blue and in white lupins.

4885 ATABEKOVA, A. I.
(White lupin and its intraspecific differentiation).
Izv. timirjazev. sel'skohozjajstv. Acad. (News Timirjazev agric. Acad.) 1961 : No. 1 : 192–97. [Russian].

The nomenclature and systematics of *Lupinus albus* are discussed and a key for classification of its five botanical varieties is provided.

4886 BARBACKI, S.
Certain physiological properties of varieties of *Lupinus luteus*, *Lupinus albus* and *Lupinus angustifolius* observed on the basis of water-rationing trials.
Genet. polon. 1960 : **1** : 103–18.

Varietal differences in response to drought were noted in *L. albus* and *L. angustifolius*; within *L. luteus*, however, varieties tended to respond similarly.

4887 FORBES, I. (JUN.) & WELLS, H. D.
Inheritance of resistance to anthracnose in blue lupines, *Lupinus angustifolius* L.
Crop Sci. 1961 : **1** : 139–41.

Resistance to *Glomerella cingulata* in selection 54–202–1–C is derived from PI68535, a wild, bitter Portuguese introduction. Studies on the progeny of Blanco x 54–202–1–C indicated that resistance is conditioned by a single pair of genes, *An An*. There appeared to be no genetic difficulties preventing the recombination of anthracnose resistance from the wild source with three desirable recessive characters of *L. angustifolius*, namely sweetness, soft seeds and the genetic marker, white seeds and flowers. Environmental factors influencing the success of artificial inoculation and screening techniques are discussed.

4888 FORBES, I. (JUN.), WELLS, H. D., EDWARDSON, J. R. & OSTAZESKI, S. A.
Inheritance of resistance to gray leaf spot disease and of an anthocyanin inhibitor in blue lupines, *Lupinus angustifolius* L.
Crop Sci. 1961 : **1** : 184–86.

The resistance of Gainesville S13 to *Stemphylium solani* is conditioned by a single recessive gene, *gl*. An anthocyanin inhibitor which arose as a spontaneous mutation in a common pink-flowered bitter blue lupin [cf. XXX, 1270] is also inherited as a single recessive gene; no linkage was found between this and the *Stemphylium*-resistance gene. In one cross, some evidence of linkage was found between *Gl* and *An*, the latter conferring resistance to anthracnose (*Glomerella cingulata*). No linkage was detected between the sweet gene, *iucundus*, and the genes for anthocyanin inhibition, grey leaf-spot resistance and anthracnose resistance. Plants combining all these characters have been obtained. It is not known whether the anthocyanin inhibitor studied here is the same as the *leucospermus* gene of European workers [cf. XXVII, 3124].

4889 NOWACKI, E.
Systematics of *Genisteae* in the light of chemical analyses.
Genet. polon. 1960 : **1** : 119–43.

From studies on the composition of their alkaloids, it is considered that the Podalyrieae and the Genisteae probably arose simultaneously from the Sophoreae. Within the Genisteae the genus *Laburnum* appears to have been the initial form from which the genus *Cytisus* arose. While *Cytisus* shows great chemical affinity with the genus *Lupinus*, the latter resembles *Crotalaria* anatomically. The alkaloid laburnine however which occurs in *Laburnum* is also present in both *Crotalaria* and *Cytisus* and thus provides a link between these two. Twenty-seven *Lupinus* species were classified into seven groups (4 European, 3 American) on the basis of alkaloid composition and their postulated relationships are presented diagrammatically.

4890 SUETSUGU, I. & TANAKA, T.
(The flowering response of *Astragalus sinicus* to photoperiod and temperature).
Hokuriku Nogyo Shikenjo Hokoku/Bull. Hokuriku agric. exp. Sta. 1960 : No. 1 : 31–44. [Japanese].

The thermal and photoperiodic requirements of the longday species *A. sinicus* are elucidated. By appropriate low-temperature treatment, it has been possible to synchronize flowering between this species and *A. reflexistipulus*, which flowers two months later, and effect hybridization.

4891 Suetsugu, I. & Ueki, C.
(Studies on fertilization in *Astragalus sinicus*).
Hokuriku Nogyo Shikenjo Hokoku/Bull. Hokuriku agric. exp. Sta. 1960 : No. 1 : 45–72. [Japanese].

The low degree of fertilization in isolated plants of this species appears to result from mechanical causes. Since individuals vary, however, in capacity for selfing, it should be possible to breed highly self-fertile strains.

4892 Suetsugu, I. & Ueki, C.
(Studies on hard seeds in *Astragalus sinicus*).
Hokuriku Nogyo Shikenjo Hokoku/Bull. Hokuriku agric. exp. Sta. 1960 : No. 1 : 89–121. [Japanese].

This study includes some data on intraspecific variation in the frequency of hard seeds. The incidence was lower in early varieties from colder areas and in late varieties from warmer areas. An association between seed hardness and shape is suspected.

ROOTS AND TUBERS

4893 Walther, F.
Eine neue Methode zur Feststellung des Ploidiegrades bei *Beta*-Rüben. **(A new method for determining the degree of ploidy in *Beta*).**
Züchter 1961 : **31** : 6–8.

After staining in 2% orcein solutions, pores in the pollen grain wall became visible as light-coloured spots. The $2n$ sugar beet and mangel material showed 5–9 pores with an average of 7, whilst 10–20 pores were observed on $4n$ material, 10–12 pores being most frequent. *B. procumbens* showed an average of 4–6 pores, *B. webbiana* 6–8, *B. maritima* 5–8 and *B. patellaris* 11–14. It is thought that counting pores is a more reliable method of determining ploidy than measuring pollen grains.

4894 Kruse, A.
Haploids in polyembryos of beet, *Beta vulgaris* L.
Årsskr. k. Vet.- o. LandHøjsk., Kbh. 1961 : 87–98.

Fourteen haploids ($n = 9$) were found in the 2800 twin or triplet plants examined. Haploids were found not only among the smaller members of twin pairs but also among the larger members. Five dihaploid plants were obtained from 16 twin pairs found in tetraploid Pajbjerg Korsroe. Cytological studies on nine haploids during the summer showed that only one retained the 9-chromosome condition; four others retained the haploid condition in the shoot but exhibited spontaneous chromosome doubling in the roots, while the remaining plants had both 9 and 18-chromosome cells in either the roots or shoots or both. [Cf. 2110].

4895 Schlösser, L.-A.
Züchtungsfragen bei Beta-Rüben. **(Breeding problems in *Beta*).**
Saatgutwirtschaft 1961 : Spec. Ed. : 18–22.

In discussing the improvement of sugar beets and mangels, special mention is made of the problems of producing varieties adapted to different conditions of climate and cultivation and of improving disease resistance: polyploid breeding is also considered.

4896 Davies, D. J. G.
Growing good fodder beet.
NZ J. Agric. 1961 : **102** : 333–35, 337, 339.

The varieties Korsroe, Yellow Dæno, Red Øtofte, Pajbjerg Rex, Hunsballe and Hinderupgaard are described.

4897 Hagsand, E. & Arnemo, B.
Försök med blastrova i norra Sverige. I. Växtodlingsförsök med blastrova. **(Trials of large-leaved turnips in northern Sweden. I. Cultivation trials with large-leaved turnips).**
Medd. Jordbruksförs. 1960 : No. 111 : 7–84.

Large-leaved turnips intended for direct feeding have been found suitable for cultivation in Norrland, Sweden. Data from trials of 12 strains are given.

4898 Opsahl, B. & Ringlund, K.
Avling, handelsverdi og matkvalitet hos forskjellige kålrotsorter. **(Yield, commercial value and table quality in different varieties of swede).**
Forskn. Fors. Landbr. 1961 : **12** : 57–78.

Data on the yields of leaves and roots and the appearance and table quality of the roots are given for 14 varieties tested in Norway in 1958–59.

4899 Warren, F. S.
Clubroot resistant swede ready for distribution.
Forage Notes, Ottawa 1961 : **7** : No. 1 : 23–24.

The club-root resistant swede N9 resulted from breeding initiated in 1942 at the Experimental Farm, Nappan, NS, to combine the purple top, smooth skin and globe shape typical of Laurentian with the superior disease resistance of Wilhelmsburger. Under controlled conditions of inoculation, N9 has exhibited the same type of club-root reaction as Wilhelmsburger, viz. susceptibility to race 1 and immunity from the common races 2 and 3. In developing N9, particular attention was paid to seed-producing ability. As a result, the variety appears to be superior to most others in this respect.

4900 GEYER, H.
Deutsche Pflanzkartoffeln sichern hohe Ernten im Kartoffelbau. (**German seed potatoes ensure high yields in potato cultivation**).
Saatgutwirtschaft 1961 : Spec. Ed. : 15–17.

In this brief survey of breeding, it is pointed out that about 3 million seedlings are raised each year in Western Germany at 34 breeding firms and stations but only 2–5 seedlings are granted a patent.

4901 HÖPPNER
Ausschnitte aus den Kartoffelsortenprüfungen 1960. (**Extracts from the potato varietal trials, 1960**).
Kartoffelbau 1961 : **12** : 52–55.

Details of the average number of days to ripening, tuber yield and starch content of 7 early, 23 medium early and 38 medium late to late varieties tested in Germany in 1958–60 are given.

4902 JÄHNL, G.
Ergebnisse der Rübenversuche des Jahres 1959. (**Results of the root trials of the year 1959**).
VersErgebn. BundesVersAnst. alpenländ. Landw., Gumpenstein 1960 : No. 53 : Pp. 45. (Mimeographed).

The results of trials of mangels, swedes and sugar beet are reported in detail.

4903 JÄHNL, G.
Ergebnisse der Kartoffelversuche des Jahres 1960. (**Results of the potato trials of the year 1960**).
VersErgebn. BundesVersAnst. alpenländ. Landw., Gumpenstein 1961 : No. 54 : Pp. 99. (Mimeographed).

A detailed report is presented of trials held in several districts in Austria.

Trabajos de la Estación de Mejora de la Patata, Vitoria. (**The work of the Potato Improvement Station, Vitoria**).
An. Inst. nac. Invest. agron., Madr. 1960: **9** : 213–440.

4904 *García Orad, A. & Pérez de San Román, F. Las pruebas de invierno en el análisis virológico por familias.* (*Winter tests on virological analysis by families*). (*pp. 215–48*).

Selection techniques for the preservation of healthy potato stocks, and serological, histological and inoculation tests suitable for diagnosing virus diseases, are discussed. Tabulated data are provided on the symptoms and virulence of virus infection in 23 varieties, tested during 1953–59.

4905 *Sañudo Palazuelos, A. Estudios citogenéticos en el género* Solanum, *series* Cardiophilla *y* Pinnatisecta. (*Cytogenetical studies in the genus* Solanum, *series* Cardiophylla *and* Pinnatisecta). (*pp. 249–333*).

A description and analysis of the meiotic abnormalities observed in 3 strains of *S. ehrenbergii*, 2 of *S. lanciforme*, 3 of *S. cardiophyllum*, 2 of *S. sambucinum*, 3 of *S. pinnatisectum* and 2 of *S. jamesii* are provided [cf. XXIX, 4036]. Observations made on a large number of intraserial and interserial crosses involving the above species, the first four of which belong to the *Cardiophylla*, are reported in detail. Interserial crosses produced fertile seeds only when the *Pinnatisecta* species was used as the ♀ parent. Intraserial crosses involving *S. sambucinum* were successful only when that species was the ♀ parent. Individual cases of hybrid inviability or weakness are discussed and possible explanations suggested.

Meiotic studies in the hybrids demonstrated the existence of frequent anomalies, similar to those observed in the parent species. The highest average number of univalents, 3·47 per cell, was found in *S. lanciforme* 'E–45' x *S. ehrenbergii* 'E–42'. Chromosome breakage was most marked in *S. ehrenbergii* 'E–41' hybrids. Pollen sterility varied widely within and between particular clones, species and hybrids; this variability is considered to be further evidence of heterozygosity. Pollen sterility, as well as the number of chromosome anomalies, tended to increase during the summer months. Environmental and genetic factors influencing pollen sterility as well as ovular, haplontic and diplontic sterility, cases of which were also observed, are discussed in detail.

4906 *Ubillos Múgica, M. Pequeña historia de cinco variedades españolas. (A short history of five Spanish varieties). (pp. 335–57).*

A detailed account is given of the potato hybridization programme conducted at Vitoria between 1938–48. The origin and characteristics of the varieties Goya [cf. XXVII, 3161], Duquesa [XXX, 1693], Turia [XXX, 1693], Olalla [XXVI, 2501] and Victor [XXVII, 3161], are described in detail.

4907 *Zubeldia Lizarduy, A. Selección para precocidad en plántulas de patata. (Selection of potato seedlings for earliness). (pp. 359–38).*

Observations on the growth and development of a large number of potato seedlings indicated that seedlings with drooping shoot apices generally mature early, while those with erect apices are late-maturing. It is recommended that selection for earliness should be carried out on dull, cool days approximately two months after sowing and one month after the young seedlings have been transplanted into soil blocks or small pots.

4908 *Escribano Isava, F. El porcentaje de "fallos" y las cosechas. (The percentage of "blanks" and harvest yields). (pp. 385–420).*

Six potato yield trials, comprising a total of 441 100-plant plots, were carried out at Vitoria between 1953–58. The results showed that only when the percentage of blanks, i.e. missing hills, was higher than 15% were yields significantly lowered as compared with control plots.

4909 PUSHKARNATH
Potato research in India.
Indian Potato J. 1959 : **1** : 1–9.

This historical account of potato breeding in India includes an outline of the present research programme and notes on some of the improved varieties developed.

4910 DALEBROUX, M.
Essai variétal sur pommes de terre réalisé à Keyberg. **(Variety trial of potatoes carried out at Keyberg).**
Bull. INÉAC 1960 : **9** : 345–49.

Gineke and Prinslander gave the highest yields in trials at the Keyberg Experimental Station.

The National Potato-Breeding Program, 1960.
US Dep. Agric. 1960 : Pp. vii + 249. (Mimeographed).

In addition to the items abstracted below, the report contains many other contributions, dealing predominantly with tests of varieties and selections in the different states and in Ontario for yield, maturity, tuber characteristics, culinary and processing qualities, storage behaviour and reactions to scab, late blight, *Verticillium* wilt, viruses and black spot. Reports of yields and other tests included in the articles summarized have in most cases similarly been omitted from mention.

4911 *Schark, A. E., Akeley, R. V. & Manzer, F. E. United States Department of Agriculture. Verticillium wilt resistance in variety and seedling tests. Varietal reaction to net necrosis and stem-end browning. (pp. 10–13).*

The wilt reaction of inoculated seedlings and varieties grown in infested soil was determined at the Aroostook Farm. Members of the X792 series were among the selections remaining free from symptoms. For several years, this series has shown a high degree of resistance. Most of the entries tested in the field for reaction to net necrosis were free from this condition; none of the selections showed symptoms of stem-end browning.

4912 *Akeley, R. V., Peterson, L. C. & Schark, A. E. US Department of Agriculture. Golden nematode resistance. (pp. 13–14).*

Over 90 clones were selected for further evaluation. Three or four may be considered for release as nematode-resistant varieties.

4913 *Buck, R. W. (Jun.). US Department of Agriculture. Solanum species and hybrids. (p. 17).*

It is briefly reported that clones of 38 diploid and 6 tetraploid species were grown in 1960 at Beltsville for studies of their cytology and crossability. Clones of 36 triploid hybrids were grown for cytological investigations. Of the 570 combinations attempted between diploid species, 172 produced seed. Of 15 combinations between tetraploid species, 7 yielded seed. Seed was obtained from 125 of the 272 combinations attempted between tetraploid and diploid species. F_2 and BC seed was also secured from diploid and tetraploid hybrids for future investigations.

4914 *Houghland, G. V. C., Akeley, R. V. & Kehr, A. E. US Department of Agriculture. Industrial potato program.* (*pp. 17–18*).

A project to develop a specifically industrial type was initiated in 1959 at Beltsville. The problem is being tackled by four lines of approach: (1) breeding, (2) selection of segregating material by means of seed germination in sucrose, as used in Germany, (3) selection by chemical analysis and (4) field selection for characters likely to promote maximum light utilization. In (1), lines with high contents of starch and dry matter are being selfed when possible or otherwise sibbed or crossed with other high-starch compatible parents. In (4) the characters desired are considered to be upright growth with the leaves held at an acute angle, abundant leaf pubescence and a corrugated leaf surface.

4915 *Schultz, E. S., O'Brien, M., Schark, A., Akeley, R. V. & Buck, R. W.* (*Jun.*). *US Department of Agriculture. Potato disease investigations.* (*p. 18–19*).

In a field test of reaction to race 0 of *Phytophthora infestans*, 46% of the seedlings were resistant. Eighty-three of the seedlings tested for reaction to mechanical inoculation with virus X were highly resistant. Many of the selections inoculated with virus Y by *Myzus persicae* in the field did not develop current-season symptoms.

4916 *Kehr, A. E.* et al. *US Department of Agriculture. North Central regional co-operative trials 1960.* (*pp. 20–27*).

Data are given on advanced breeding lines as regards yield, time of maturity, total solids, scab reaction, internal and external defects and overall rating. One selection from the 1959 trials has been named and released as Redskin (Pontiac x B400–1) [cf. 629 and 2138].

4917 *Sparks, W. C. US Department of Agriculture. Pacific Northwest. Idaho* (*Aberdeen*). (*p. 28*).

Progress is reported in breeding an improved Russet Burbank type with resistance to *Verticillium* wilt, scab and *Fusarium* (*Hypomyces*) *solani* var. *eumartii*. Increased emphasis in breeding is being placed on qualities such as high specific gravity, low reducing-sugar content and ability to recondition, required in varieties for the processing industry.

4918 *Dykstra, T. P. US Department of Agriculture. Southern project.* (*Louisiana Headquarters*). (*pp. 29–32*).

Development of red varieties continues to be a major aim. Hybridization between red varieties and disease-resistant white varieties has been largely discontinued; the seedlings often possessed disease resistance but were invariably unsatisfactory in skin colour. The best red selections from such combinations were therefore back crossed with red varieties. Disease-resistant selections with tubers satisfactory in shape and red skin, derived from the back crosses, have been widely tested. Some have been used as parents.

Information is given on the performance of the scab and late-blight resistant red variety Catoosa [cf. 629, 2150].

Disease-resistant white varieties are also required. A promising white selection, TL6937, resistant to late blight and scab, is under extensive test.

4919 *Dearborn, C. H. Alaska.* (*p. 43*).

Since 1955, considerable progress has been achieved in breeding potatoes with frost-hardy tops. Even when the temperature fell to 25° F. in 1960, several clones showed practically no injury to the foliage. Good tuber size has been attained in one clone.

4920 *Weigle, J. L. Colorado.* (*pp. 53–54*).

Data are given on crisp colour and percentage of reducing sugars for varieties and seedlings subjected to different storage conditions after being grown in trials at two centres. Those for entries grown in one of the localities showed a trend of an inverse relationship between reducing-sugar percentage and crisp colour with storage for 2 months or longer at 40° F., and this relationship was exploited in screening out at least part of the undesirable material in a breeding programme.

4921 *Eddins, A. H. Florida* (*Hastings*). (*pp. 59–60*).

Further testing for reaction to corky ring spot is reported. Delus and four seedlings (B294–65, B313–21, B606–3 and TL1859) have not developed the disease in the two to ten years for which they have been tested.

4922 *Sanford, L. L.* et al. *Iowa.* (*pp. 74–83*).

Crosses were made with the following objectives: improved yield, high quality as regards such properties as internal colour, dry-matter content and texture, and resistance to scab, late blight, *Verticillium* wilt and viruses.

Selections resistant to leaf hopper (*Empoasca fabae*) were studied. Probably some are unsuitable as sites for egg deposition while others possess certain properties which prevent damage resulting from leaf-hopper feeding.

In an analysis of general (GCA) and specific (SCA) combining ability, 190 crosses were made between 45 breeding lines and 6 tester clones. In the case of yield, SCA was more important than GCA. A large number of testers would be required to differentiate between the relatively small additive effects found. GCA was more important than SCA in determining specific gravity. GCA and SCA were of equal importance in influencing tuber "appearance measurements". Additive variation for specific gravity and tuber appearance is probably of sufficient magnitude for the realization of substantial genetic advance through developing clones with good GCA.

4923 *Miller, J. C. Louisiana. (pp. 85–94).*
Progress in breeding high-yielding white and red varieties with good nutritional quality and resistance to scab and late blight is reported. Attention is also being given to selecting more oblong potatoes, suitable for making crisps, chips and other processed products. Breeding varieties showing some degree of frost resistance is being further pursued. Progenies from crosses between *Solanum acaule* and *S. tuberosum* are being tested. Experiments on preserving pollen by freeze drying and subsequent gas storage are giving encouraging results.

4924 *Simpson, G. W.* et al. *Maine. Leafroll-resistant seedlings. (pp. 100–04).*
Field testing of hybrid progenies and selfed lines for resistance to leaf roll continued. Information on parentages is included. The material tested originated in breeding programmes in the USA and abroad.

4925 *Manzer, F. E., Easton, G. D., Akeley, R. V., Schark, A. E. & Merriam, D. Maine. Ring rot resistance studies. (pp. 105–08).*
Tests and retests of hybrid seedlings and named varieties for ring-rot reaction are reported.

4926 *Hooker, W. J., Isleib, D. R. & Thompson, N. R. Michigan. (pp. 115–18).*
Seedlings from crosses were screened for immunity from virus X and late blight. Of the three seedlings under consideration for release jointly by the Michigan and Iowa stations and US Department of Agriculture, one (R123–9) has been developed in Michigan. Adapted to the northern part of the state and in the same class as Russet Rural for maturity, R123–9 is resistant to scab and late blight.

The frequency of virus-X immune individuals in the progeny of seedling S41956 showed a marked increase as the result of as little as two generations of selfing immune plants.

4927 *Lauer, F. I.* et al. *Minnesota. (pp. 119–23).*
The combining of factors controlling adaptation, market and table qualities and resistance to scab, late blight and virus X continued to be the chief aim of breeding. Tests of the scab reactions of progenies derived from nearly 300 crosses involving 170 parents showed that the parents fell into three groups for combining ability for resistance, depending on their scab-resistant ancestry and rating for reaction. Pollen has been successfully stored for at least one year at −24° C. [cf. 2126].

4928 *Yager, L. A. Montana. (pp. 125–27).*
In the project initiated in 1960, emphasis is to be given to breeding varieties superior to Netted Gem, Bliss Triumph and Pontiac.

4929 *O'Keefe, R. B., Nuland, D. & Miyoshi, R. T. Nebraska. (pp. 128–39).*
The chief aims of crosses effected in 1960 were: (1) to intensify scab resistance in red clones, (2) to combine scab resistance with high productivity in clones with good internal tuber quality and (3) to incorporate genes for resistance to heat, late blight and virus X in commercially acceptable clones.

Further work was carried out on the components of phenotypic variance for inheritance of scab resistance and on the development of parental lines with increased combining ability for this character. Heritability estimates obtained by parent-offspring regression substantiated the hypothesis that additive as well as dominant gene effects should be considered in developing parental lines. The feasibility of testing parental lines for scab resistance and yielding ability simultaneously is being investigated.

The first clonal generation (C_1) of inbred and hybrid progenies of heat-resistant and susceptible parents was tested in a heat machine [cf. XXX, 520]. Heritability estimates for heat resistance (score for leaf and stem damage) were respectively 0·19 and 0·17 for families and selections in families, as calculated by the components of variance method. Heritability estimates of 0·24–0·34 (parent-offspring regression) were obtained in 1959 for the same progenies grown from true seed. The mean resistance was lower in the C_1 than in the seedling progenies and was intermediate between the two parental-inbred progeny means. The data on the C_1 suggested that susceptibility was dominant but, unlike those for the seedlings, provided no evidence of a cytoplasmic effect. Populations have been developed for testing parental lines for cytoplasmic effects and for combining ability for resistance to heat and to heat-induced drought in successive inbred generations. Heat resistance has been found to be correlated with height and leaf area. The feasibility of utilizing multiple regression and a selection index in developing resistant parents is therefore being explored.

4930 *Plaisted, R. L. & Peterson, L. C. New York.* (*pp. 160–62*).
Progress was made in recurrent selection for high specific gravity. Inheritance of resistance to *Heterodera rostochiensis* in *S. vernei* is under investigation. Both this species and *S. andigenum* have been used as sources of nematode resistance, but greater use has been made of the latter species since its resistance appears to be under the control of a single gene. Many of the resistant selections grown in yield trials during 1960 in four localities in New York State compared favourably with Katahdin. A high number of the selections under tests in the project on nematode resistance possess multiple resistance to several diseases.

4931 *Haynes, F. L. & Nielsen, L. W. North Carolina.* (*pp. 167–71*).
Breeding continued with its primary objectives of improved early-maturing varieties resistant to late blight, scab and southern bacterial wilt (*Pseudomonas solanacearum*); emphasis is also being laid on crisp-making quality. In breeding for resistance to bacterial wilt, Prisca has the highest degree of resistance among the parents available. Investigations of cytological and genetic relationships between diploid species of the series *Tuberosa* are under way.

4932 *Johansen, R. H., Lana, E. P. & Benson, A. P. North Dakota.* (*pp. 172–85*).
Crosses were effected to combine disease resistance with good tuber type, red colour, russeting, high yield and high quality; other crosses involved parents with good processing qualities. Some North Dakota selections were resistant to scab in field tests, a few of these also showing resistance to silver scurf (*Spondylocladium atrovirens*). In further screening for resistance to race 0 of late blight and immunity from virus X, several selections were resistant to both diseases.

4933 *Sleesman, J. P. Ohio.* (*p. 188*).
Data were obtained on 55 advanced selections, over 2000 first-year seedlings, 24 species, 100 foreign varieties, 53 interspecific hybrids and 42 derivatives of crosses of *S. tuberosum* (haploid) with diploid species as regards feeding by adult flea beetles (*Epitrix cucumeris*), populations of leaf hopper (*Empoasca fabae*) and degree of hopper burn. Three advanced selections showed high resistance to both pests but were low in yield, with unsatisfactory tuber characteristics and late maturity. None of the foreign varieties offered a source of high resistance. *S. berthaultii*, *S. brachycarpum*, *S. bulbocastanum*, *S. cardiophyllum*, *S. chacoense*, *S. pinnatisectum* and *S. setulosistylum* were free from leaf-hopper nymphs and hopper burn, with a very low amount of flea-beetle feeding. About 50% of the interspecific hybrids showed little or no hopper burn and relatively low nymph populations. Many of them were very lightly fed upon by flea beetle but no association was detected between flea-beetle feeding and leaf-hopper population. Most selections from *S. tuberosum* (haploid) x diploid species were susceptible to both insects. US–W7 x *S. chacoense* and US–W7 x *S. kurtzianum* were highly resistant to leaf hopper.

4934 *Mills, W. R. Pennsylvania.* (*pp. 197–98*).
For the past several years, all new seedlings have been tested for crisp-making quality. Use of parents known to possess good quality for this purpose has resulted in hybrid progenies with a large proportion of seedlings making good crisps. Of the new selections grown in 1960, 75% made better crisps than Katahdin. Emphasis is also being placed on breeding for late-blight resistance.

4935 *Locke, S. B. Washington* (*Pullman*). (*p. 220*).
Progenies were selected for field resistance to leaf roll. Among the resistant parents, B24–58 imparted most resistance to its progenies while X247–48, Katahdin and B2195–8 were less effective. Of the susceptible parents, B2193–48 was notable for its value as a parent imparting desirable horticultural characteristics.

4936 *Hoyman, W. G. Washington* (*Prosser*). (*pp. 225–26*).
Crosses were effected so as to combine factors for resistance to leaf roll, scab and *Verticillium* wilt. In addition, in some crosses one or both parents introduced factors for resistance to late blight, powdery mildew, aster yellows and viruses X and Y. Parents with high total-solids content were utilized as much as possible. PI214372, resistant to leaf roll and having a total-solids content of 24·8%, frequently figured as ♂ parent. B3820–14, highly resistant to leaf

roll and *Verticillium* wilt, was also used extensively as a parent.

4937 *Kishore, H. & Rieman, G. H. A recessive type of immunity to virus X in the common potato. (pp. 233–34).*
[Cf. 2234].

4938 *Hougas, R. W. & Peloquin, S. J. Wisconsin. (pp. 235–37).*
Frequency of haploidy in *S. tuberosum* is influenced by (1) choice of the *S. tuberosum* parent, (2) choice of the "pollinator" and (3) techniques to promote fruit retention after pollination, e.g. decapitation. Further investigations confirmed the superiority of *S. phureja* '225682.1' as pollinator [cf. 2134]. Two more outstanding pollinators (225682.13 and 225682.22) have been found in this species. One of these three pollinators is homozygous for *P* for purple pigment in the young seedlings and the other two are heterozygous. Use of these selections as pollinators has greatly increased the efficiency of obtaining haploids from most *S. tuberosum* stocks. F_1 hybrids of back crosses of *S. tuberosum* (haploid) x cultivated diploids were selected. A low level of self compatibility (pseudofertility) was found among some seedling clones in 8 of 12 diploid species. The number of clones which selfed and the degree of self compatibility were both increased by means of decapitation and by keeping the decapitated plants in an air-conditioned greenhouse at 18–22° C.

4939 LINARES S., P. J. & MITTELHOLZER, A. S.
Diez años de ensayos de papa en Venezuela. **(Ten years of potato trials in Venezuela).**
Agron. trop., Venezuela 1959 : **9** : 93–104.
The results of yield trials, conducted between 1950 and 1959, are reported. Red Pontiac, Kennebec and Sebago gave the highest yields at low altitudes (0–1500 m.), while at higher elevations (1500–2500 m.) Saco, Alpha and Profijt [Profit] were outstanding. A group of *Solanum tuberosum* x *S. andigenum* hybrids gave promising results at 750 m.

4940 MADEC, P.
La sélection de la pomme de terre. **(Potato breeding).**
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 127–34.
The objectives and present position of potato breeding in France are discussed. The main agronomic characteristics of 17 varieties, developed in France during 1946–58, are tabulated.

4941 HOWARD, H. W.
Potato cytology and genetics, 1952–59.
Bibliogr. genet. 1960 : **19** : 87–216.
This comprehensive review of recent studies in the taxonomy, cytology and genetics of *Solanum tuberosum* and related species includes sections dealing with chromosome numbers and morphology; meiosis in species and interspecific hybrids; haploids and experimentally produced polyploids; genome analysis; sterility; interspecific hybridization; tetrasomic inheritance; inheritance of resistance to various pests and diseases and to high and low temperatures; inheritance of certain morphological and physiological characteristics; the occurrence of mutations and chimeras; photoperiodism; chemical composition of tubers; and breeding techniques.

4942 AVDEEVA, Z.
(From seed).
Kartofel' i Ovošči (Potato & Vegetables) 1960 : No. 3 : 23–24. [Russian].
Selfed progenies of 46 potato varieties were examined and 24 of them gave fairly uniform progenies. Only 9 proved sufficiently free from segregation to be used for regular reproduction by seed, the best in this respect being Kinel'skij Bogatyr' [Kinel' Hero]. Seedlings produced in this way were healthy and yielded up to 400 c. of tubers per ha.

4943 WITTSTOCK, I.-M.
Graphische Darstellung zur Beurteilung von Kartoffelkreuzungen. **(A graphical arrangement for judging potato crosses).**
Züchter 1961 : **31** : 2–4.
In judging the crossability of varieties and the performance of the F_1, it was found convenient to set out the results in columns on a graph. For each cross, the numbers of flowers pollinated and berries set were shown in one column, an adjacent column showing the number of F_1 plants producing tubers and the number of plants selected for having the desired characters.

4944 NIKOGOSJAN, E. E.
(Some factors influencing the productivity of potato seedlings).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 1 : 58–59. [Russian].
The following factors were shown to influence the productivity of potato crosses: size of berry; size of seed; the provenance of the parental lines; soil conditions under which parental varieties were cultivated; freshness of the pollen

(pollen direct from the flower gave more productive progeny than pollen stored for 13 days); time of day at which pollination was effected (noon pollination was superior to evening pollination); and date of pollination (pollination in early June was superior to pollination in early August). The parental varieties of a number of productive seedlings are listed.

4945 Graham, K. M. & Dionne, L. A.
Hybrids between *Solanum bulbocastanum* and *Solanum cardiophyllum*.
Nature, Lond. 1961 : **190** : p. 744.

Extensive collections were made of *S. bulbocastanum* and *S. cardiophyllum* (*S. cardiophyllum* sensu stricto, *S. ehrenbergii* and *S. cardiophyllum* var. *endoiodandrum*) throughout their areas of distribution in Mexico during 1956 and 1957. In work at the Canadian Department of Agriculture Research Station, Fredericton, NB, seed set occurred in *S. bulbocastanum* 'C–238' ♀ x *S. cardiophyllum* 'C–297' ♂ and *S. ehrenbergii* 'C370' ♀ x *S. bulbocastanum* 'C–194' ♂. As seedlings, hybrids from both crosses showed the unifoliate characteristics of *S. bulbocastanum*. As they approached the flowering stage, they had the appearance of a compound-leaved *S. bulbocastanum*. Although the hybrids produced a high percentage of stainable pollen, it was not always possible to secure fruit and seed set by sibling pollination within the families C–238 x C297 and C–370 x C–194. Interfamily cross pollinations were successful in both directions.

4946 Grun, P.
Early stages in the formation of internal barriers to gene exchange between diploid species of *Solanum*.
Amer. J. Bot. 1961 : **48** : 79–89.

Crosses were attempted between closely related species, belonging to series *Tuberosa* and *Commersoniana*, and data obtained on berry set, seed number per berry, percentage seed germination and F_1 vigour and pollen fertility. Clones of the following were used as parents: *S. phureja*, *S. stenotomum*, *S. soukupii* and *S. simplicifolium* in series *Tuberosa* and *S. chacoense*, *S. chacoense* spp. *subtilius*, *S. commersonii*, *S. kurtzianum* and *S. tarijense* in series *Commersoniana*. Observations on berry set led to four main conclusions. (1) Hybrids between the two series may be readily produced. (2) In general, however, crossings within a series were more easily accomplished than between series. Success of *Tuberosa* x *Tuberosa*, *Commersoniana* x *Commersoniana*, *Tuberosa* x *Commersoniana* and *Commersoniana* x *Tuberosa* combinations averaged 43, 48, 35 and 34%, respectively. Comparison of the intraseries and interseries crossabilities of the individual species confirmed this conclusion. (3) Species in the same series, and even clones of the same species, differed in crossabilities. (4) Species differed in their effectiveness as ♂ or ♀ parents, numerous cases of reciprocal differences being found. With the exception of (3), data on number of seeds per berry confirmed these conclusions. Seed germinability and F_1 vigour and pollen sterility did not appear to play any part in genetic isolation. Pollen stainability in all crosses was high, no differences being evident between intraseries and interseries combinations.

4947 Deshmukh, M. J. & Verma, S. M.
Studies on the first inbred in Phulwa.
Indian Potato J. 1960 : **2** : 30–38.

At the Central Potato Research Institute, Simla, India, selfed seedlings of Phulwa exhibited a wide range of variability in plant and tuber characters. On the basis of tests on the clonal progenies of 4533 seedlings, six selections were made. These give yields equal to those of the parent variety, and the tubers are of equal keeping quality. The selections produce shorter stolons with larger tubers and mature 15–20 days earlier than the parent.

4948 Vavilova, M. A.
(Bud mutations in potato in Zapoljar'e).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 259–63 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G299. p. 30. [Russian].

Potatoes grown in the Kola peninsula often give rise to mutants, mostly bolters or forms with corollas or tubers differing from the parent variety. A bolter mutant of Imandra and mutants of Hibinskaja Sineglazka [Hibiny Blue-eyed] with flowers or tubers of a different colour are described. All are less productive than the original cultivars.

4949 Demidovič, A.
(A new early potato variety).
Sel'sk. Hozjajstv. Tatar. (Agric. Tatar.) 1959 : No. 4 : 17–19 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G580 : p. 54. [Russian].

Tatarstan (Epicure x *Solanum curtilobum*) was bred at Kazan'. It is early and resistant to *Phytophthora* and *Synchytrium* and yields 410·9 c. tubers with a starch content of 16·4% per ha.

4950 Pushkarnath

Commercial potatoes in India. Kufri Kuber.

Indian Potato J. 1960 : **2** : 102–03.

Bred at the Potato Breeding Station, Simla, in 1943, Kufri Kuber is a selection from (*Solanum curtilobum* x *S. tuberosum* 'Deodara') x *S. andigenum*; it matures early and gives good yields of medium-sized, yellow-fleshed tubers. A description of the variety is accompanied by notes on its performance in the hill and plain regions of India.

4951 Novák, F.

Nové odrůdy bramborů. (**New potato varieties**).

Za socialist. Zeměd. 1959 : **9** : 523–27.

Four Czechoslovak varieties were registered in 1958. Rajka, bred at the Keřkov Station, is an early to midearly culinary variety similar to Bintje; it has oval tubers with yellowish flesh. It is more productive than Bintje and more resistant to late blight and scab but is susceptible to wart. Oslava [Celebration] from the Stránecká Zhoř station is noteworthy for its resistance to virus diseases; it is semiearly and has yellow flesh of good culinary quality. Doubrava is a semiearly industrial variety from the Vyklantice Breeding Station; it has a starch content of 18% and is resistant to wart. Tatranka from the Velká Lomnice Station is a semilate to late wart-resistant variety for fodder and industrial use.

4952 Komkova, M.

(**New standard varieties**).

Kartofel' i Ovošči (Potato & Vegetables) 1960 : No. **4** : p. 23. [Russian].

Brief descriptions are given of the following new potato varieties: Kurganskij 1, an early-maturing VIR445 [Institute of Plant Industry 445] x Narymčanin [potato from Narym] cross; Har'kovskij Rannij [Har'kov Early], an early-maturing Ėlla x Katahdin cross resistant to degeneration; and Baranovskij (17 Parts''ezd) [Baranovka (17th Party Congress)], a mid-season selection resistant to *Phytophthora*, *Synchytrium* and degeneration. All three varieties are high yielding and of good culinary quality.

4953 Andrianova, K.

(**Promising varieties at the Falenki State Breeding Station**).

Kartofel' i Ovošči (Potato & Vegetables) 1960 : No. **4** : 24–25. [Russian].

Detailed descriptions are given of Severnaja Roza [Northern Rose], an early-maturing, high-yielding Early Rose x Jubel potato line of high culinary quality and Falenki, a midseason, high-yielding Epicure x Deodara cross with notable resistance to drought, frost and *Phytophthora*.

4954 **Commercial potatoes in India. Up-to-Date.**

Indian Potato J. 1961 : **1** : 25–27.

A description of this old variety is given, together with notes on its performance in various regions of the country.

4955 Pushkarnath

Commercial potatoes in India. Darjeeling Red Round.

Indian Potato J. 1960 : **2** : 52–54.

This description of an old and widely-grown variety includes a note on a high-yielding clone selected from it and released under the name Kufri Red; the selection produces good quality pink-skinned tubers.

4956 Akeley, R. V., Perry, B. A. & Schark, A. E.

Redskin, a new red variety of potato resistant to scab, with high yielding ability and adapted to growing conditions in the south.

Amer. Potato J. 1961 : **38** : 81–84.

This variety, which has already been briefly reported [cf. 629 and 2138], is described in detail. Selected from USDA seedling B400–1 x Pontiac, Redskin is resistant to wind damage and, in trials in Texas and Florida, has recovered well after frost damage; it is partially resistant to *Verticillium* wilt. The tubers have white flesh and a high dry-matter content.

4957 Picha, B.

Erli-red, a new early variety of potato with bright red tuber color and superior market attractiveness.

Amer. Potato J. 1961 : **38** : 78–80.

A detailed description, including pedigree, is given of a variety already briefly reported [cf. 2135]. Selected from 43.23–6 x 43.17–16, Erli-red matures at the same time as Waseca which it equals or slightly exceeds in yield. The tubers have white flesh and good palatability.

4958 Inscription de variétés de pommes de terre au Catalogue des Espèces et Variétés de plantes cultivées. **(Registration of potato varieties in the Catalogue of Species and Varieties of Cultivated Plants).**
Pomme d. Terre. franç. 1961 : **24** : No. 259 : 3–8.

Arka was developed from Gineke x 1VP647, is semilate and bears red-skinned tubers with yellow flesh. Of the remaining varieties, all except Avenir have tubers with yellow skin and flesh. Primabel (Frühmölle x 834C29) and Primura (Majestic x Sirtema) are early varieties; Carla (Apta x Oberarnbach), Diva (Saskia x 914B52) and Ostara (Ari x Sientje) are early to semiearly; and Daroli (Eersteling x 914B52) and Kerebel (835A4 x Record) are semiearly. Avenir [cf. XXVIII, 683] and Lori [cf. XXVI, 2501] are also described. All these varieties are resistant to wart disease; with the exception of Ostara, Primura and Avenir, they are also blight resistant.

4959 Johansen, R. H., Lana, E. P. & Benson, A. P.
New Snowflake potato.
N. Dak. Fm. Res. 1961 : **21** : No. 10 : 26–27.

Snowflake (Kennebec x ND457–1), a white-skinned variety, possesses early maturity, field resistance to virus Y and good quality for processing and fresh use.

4960 Zingstra, H.
J. P. G. Könst kweker van 3 aardappelrassen. **(J. P. G. Könst, breeder of three potato varieties).**
Zaadbelangen 1961 : **15** : p. 125.

A biographical note on Könst, breeder of the varieties Meerlander, released in the Netherlands in 1947, Meerster [cf. XXVI, 2501] and Arka, released in France in 1960, is presented. The last mentioned, developed from the cross 19268 x Gineke, has long red-skinned tubers and is resistant to *Phytophthora*.

4961 Vălčev, P.
(Studies of the varietal position of land potatoes in Bulgaria).
Izv. central. naučn.-izsled. Inst. Rasten. (News central sci.-res. Inst. Pl.-Industr.), Sofija 1960 : **9** : 223–49 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 845 : 57–58. [Bulgarian]. (Mimeographed).

Land varieties and others introduced into Bulgaria some time ago were studied and described. Most variation was found in potatoes in mountainous regions. In general land varieties possessed good field resistance to virus *y* but were very susceptible to leaf-roll virus; only the varieties Bjal ran [White Early] and Bjal jajceviden [White Oval] showed good resistance to leaf-roll virus. Červen kăsen [Red Late] had satisfactory resistance to *Phytophthora infestans*. Some of the varieties had good culinary quality but none were very good in this respect. The varieties Ranni rosovi [Early Rose], Limonki, Žalt kartof [Yellow Potato] and Červen kăsen are thought to be worth cultivating.

4962 Matsubayashi, M.
Studies on the haploid plants of *Solanum tuberosum*. II. Meiotic chromosome pairing in the polyhaploid plants.
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 195–202.

Using PMCs collected on a day in June and on another in July, meiosis was investigated in polyhaploids ($2n = 24$) of *S. tuberosum* and in *S. stenotomum* ($2n = 24$) at the Hyogo Agricultural College, Japan. Average temperature for the three nights preceding the June collection was 16·7° C.; the corresponding figure for the July collection was 24·6° C. In the polyhaploids, 65·7% of the cells fixed in June had 12_{II}, $11_{II} + 2_{I}$ being found in 25·0%, $10_{II} + 4_{I}$ in 7·9% and $1_{III} + 10_{II} + 1_{I}$ in 1·4%. Of the cells fixed in July, only 5·0% had 12_{II}, the remainder having $5\text{–}11_{II}$ and corresponding numbers of univalents. A single trivalent was observed in 6·1% of the cells. *S. stenotomum* regularly formed 12_{II} in both months. This species produced a high percentage of stainable pollen, but the polyhaploids produced no such pollen, except for the rare occurrence of medium-sized and giant grains which appeared to be nonfunctional. The results are interpreted as being in support of the view that *S. tuberosum* is a segmental allotetraploid.

4963 Kiper, I. M.
(Breeding potatoes for earliness).
Agrobiologija (Agrobiology) 1960 : No. 3 : 250–55. [Russian].

Hybrid seed sown outdoors in the summer gave a high percentage of early forms at the Dokučaev Institute.

4964 Meinl, G. & Möller, K.-H.
Die Ermittlung des Anteils von Sämlingen verschiedener Reifezeit in Kreuzungspopulationen durch Spaltöffnungszählungen. (**The determination of the proportion of seedlings of different maturity period in hybrid populations by counts of stomata**).
Züchter 1961 : **31** : 1–2.

In five of the six hybrid populations investigated, counts of stomata gave a correct forecast of the proportions of early and late seedlings [cf. XXXI, 636].

4965 Srinivasachar, D. & Dwivedi, R. S.
Breaking dormancy of true seeds of tuber bearing *Solanum* species.
Indian Potato J. 1959 : **1** : 10–13.

Diploid *Solanum* species have a shorter dormancy period than the tetraploid species. Maximum germination was obtained when seeds were soaked in a 30% solution of sulphuric acid for 10–12 min. Treatment with aqueous KNO_3 solution did not markedly improve germination in the diploids but was effective in tetraploid species; an 0·3% solution gave the best results.

4966 Dionne, L. A.
Mechanisms of interspecific incompatibility in tuber-bearing *Solanum* species.
Amer. Potato J. 1961 : **38** : 73–77.

Species belonging to sections *Acaulia*, *Bulbocastana*, *Cardiophylla*, *Circaeifolia*, *Conicibaccata*, *Commersoniana*, *Longipedicellata*, *Polyadenia* and *Trifida* were intercrossed in various combinations and also crossed with *Tuberosa* species. Crosses which failed to produce viable seeds are placed in three categories based on the three causes of seed failure encountered: (1) defective pollen tube growth and consequent lack of fertilization, (2) defective ovarian growth after fertilization has occurred and (3) abortion of all embryos at an early stage of development.

4967 Maierhofer, E.
Eine Methode zur Anzucht von Kartoffelpflanzen zur Kreuzung und Samengewinnung. (**A method for raising potato plants for crossing and seed production**).
Bodenkultur : Ausgabe A 1961 : **12** : 6–8.

This method is suitable for varieties which will flower under the photoperiodic conditions of Germany. All eyes except one are removed from the tubers before pregermination. The resulting plants with single shoots flower for three months thus facilitating hybridization work.

4968 Pushkarnath
Potato flower biology series. I. Flower and flowering.
Indian Potato J. 1960 : **2** : 12–29.

A detailed description of the inflorescence and flowers of various tuber-bearing *Solanum* species is followed by an account of the mechanism of flower opening. Information is given on the time of flower opening and closing and on the flowering behaviour of different species; a final note gives details of the crossing techniques employed at the Central Potato Research Institute, Simla, India.

4969 Effmert, B., Meinl, G. & Vogel, J.
Atmung, Zuckerspiegel und Ascorbinsäure-Gehalt von Kartoffelsorten bei verschiedenen Lagertemperaturen. (**Respiration, sugar content and ascorbic acid content of potato varieties at different storage temperatures**).
Züchter 1961 : **31** : 23–32.

Studies of 40 varieties and strains stored at 1, 5 and 15° C. are reported. Intensity of respiration and variation in this respect between varieties were lowest at 5° C. and highest at 15° C. For some varieties such as Frühmölle and Vera, the intensity of respiration at 15° C. was much greater than at 1° C. whilst others like Ackersegen and Voran showed little response to the higher temperature. The varieties Schwalbe [Swallow], Spatz [Sparrow] and Star [Starling] and the strains Lüsewitz 52.407/30 and 52.357/20 had a low total sugar content at the three storage temperatures; Meise [Titmouse], Frühnudel, Mittelfrühe [Medium Early], Aquila, Nova, some early varieties and the strains Lüsewitz 52.394/34 and 51.58/24 and Lindenhof 2563/51 and 1171/50 had high sugar contents. With the exception of Spika, varieties with a low total sugar content developed slowly when young and the high-sugar varieties developed rapidly. Late varieties produced less ascorbic acid than early varieties; in all cases the content of ascorbic acid decreased gradually during storage. Ascorbic acid content was correlated with intensity of respiration.

4970 Welte, E. & Müller, K.
Zur Frage der Stärkebestimmung in Kartoffeln. (**The problem of starch determination in potatoes**).
Landw. Forsch. 1961 : **14** : 100–04.

Ever's technique was found to be simpler than that of Steiner and Guthrie and suitable for serial determinations of potato starch. Steiner and Guthrie's method has the advantage of being also applicable to other plant material. The results obtained with both methods for 12 potato varieties are tabulated.

4971 HAWKES, J. G. & HJERTING, J. P.
Some wild potato species from Argentina.
Phyton, Vicente López 1960 : **9** : 140–46.

A description is given of a new species, *Solanum venturii*, which has previously been confused with *S. microdontum*; it is suggested that *S. venturii* may be a recent derivative of the latter. Within *S. microdontum* two subspecies are distinguished: (1) *microdontum*, which includes *S. bijugum* and (2) *gigantophyllum*, which includes all the larger-leaved forms previously known as *S. simplicifolium*.

4972 OCHOA, C.
Una variedad nueva de *Solanum multiinterruptum* Bitt., especie tuberífera peruana poco conocida. **(A new variety of *S. multiinterruptum* Bitt., a little-known Peruvian tuberiferous species).**
Agronomía, Lima 1960 : **27** : 242–45.

S. multiinterruptum var. *machaytambinum* is described.

4973 OCHOA, C.
Nuevas especies de *Solanum* (*Tuberarium* subsec. *Hyperbasarthrum*) del Perú. IV. **[New Peruvian species of *Solanum* (*Tuberarium* subsec. *Hyperbasarthrum*). IV].**
Agronomía, Lima 1960 : **27** : 363–72.

The following new species and varieties are described: *S. paucissectum*, *S. yamobambense*, *S. jaenense*, *S. acaule* var. *albicans* and *S. chiquidenum* var. *porconense* [cf. 645].

4974 **Potato news digest.**
Indian Potato J. 1959 : **1** : 40–46.

Varietal differences in response to fertilization with potassium sulphate are reported.

4975 RAJAT DE
Effect of potassium on the yield, mineral composition and carbohydrate content of potato varieties.
Indian Potato J. 1960 : **2** : 70–77.

Varietal differences in response to various potassium sulphate treatments are recorded.

4976 ROTHACKER, D.
Arbeiten und Ergebnisse über die züchterische Lösung phytopathologischer Fragen bei der Kartoffel. **(Work and results respecting the solution by breeding of phytopathological problems in potato).**
Meded. LandbHogesch. Gent 1960 : **25** : 1076–86.

Preliminary work at Gross-Lüsewitz has shown that resistance to the wart biotype G_1 is to be found in *Solanum curtilobum*, *S. andigenum*, *S. phureja*, *S. rybinii*, *S. catarthrum*, *S. simplicifolium*, *S. vernei* and *S. chacoense*. A method of testing for scab resistance has been devised; several cultivated varieties have shown low susceptibility. F_2 lines from *S. andigenum* x *S. tuberosum* have shown a lower reduction in yield on nematode-infested soil than the susceptible standard Capella and have proved effective in reducing the numbers of larvae in the soil by up to 90%. Resistant lines giving good yields have been obtained from *S. vernei* x *S. tuberosum* x *S. tuberosum* and further back crosses to potato. Plants with 1–8 cysts are found more often in resistant material of these hybrids than in that of *S. andigenum* hybrids. With respect to the tobacco brown-vein strain of virus Y, resistant species have been found in the series *Longipedicellata*, *Pinnatisecta*, *Demissa*, *Commersoniana* and *Tuberosa*.

4977 DARJANTO
Dapatkah Indonesia meghentikan import kentang dari luar negeri dan menjelenggarakan pembibtan sendiri? **(Is Indonesia able to stop importing potato and to breed its own seedlings ?)**
Tehn. Pertanian 1953 : **2** : 46–49.

In this discussion of the possibilities of breeding in Indonesia, it is noted that the wild species *Solanum chacoense* and *S. caldesii* are highly resistant to *Pseudomonas solanacearum* and *Phytophthora infestans*. Koninkjes [Little King's], the only Indonesian variety resistant to *Ps. solanacearum* has never been observed to flower. Certain American varieties are mentioned as being of interest for their resistance to virus A.

4978 CONROY, R. J.
Some notes on the incidence of potato diseases in New South Wales in the seasons 1958/59 and 1959/60 and comments on breeding for disease resistance.
Agric. Gaz. NSW 1961 : **72** : 20–22.

Tests in the Central Tablelands region showed that Emilia, Ontario and Menominee are highly resistant to *Streptomyces scabies.* A group of 71 advanced seedlings, developed at the New England Experiment Farm, Glen Innes, are reported to be immune to *Phytophthora infestans* race 0.

4979 Lapwood, D. H.
Potato haulm resistance to *Phytophthora infestans.* I. Field assessment of resistance.
Ann. appl. Biol. 1961 : **49** : 140–51.

The resistance of the haulms of Up to Date, King Edward, Majestic and Arran Viking was assessed in the field from 1956 to 1959 at the Rothamsted Experimental Station, England. The rate of defoliation was evaluated by the British Mycological Society key for blight destruction, a rapid over-all visual estimate being made of the percentage killing of the total haulm. It was also estimated more critically by frequently observing five tagged leaves on each of ten stems per plot, infection and subsequent destruction by blight or other causes being recorded on five leaflets per leaf (the terminal and two distal pairs). Defoliation could thus be related to infection by this more refined method. Although the varieties are reputed to differ appreciably in resistance, the disparities measured were smaller than expected and significant in only two seasons. The differences were more clearly shown by data on individual leaves than by assessing the effects on whole plots. The greater resistance of Arran Viking and Majestic, compared with the other two varieties, was associated with a slower increase in infection at the start of an attack rather than with differences in rate of haulm destruction when the attack was well advanced. There was however some evidence that leaves of King Edward died most rapidly and those of Arran Viking most slowly after infection.

4980 Lapwood, D. H.
Potato haulm resistance to *Phytophthora infestans.* II. Lesion production and sporulation.
Ann. Appl. Biol. 1961 : **49** : 316–30.

Further investigations at the Rothamsted Experimental Station, England, have suggested that the slower rate of foliage infection in Majestic and Arran Viking than in Up-to-Date and King Edward in field plots is more closely related to production of fewer spores than to greater resistance to primary infection of the leaf blades, although the two former varieties were more resistant than Up-to-Date and King Edward when inoculated in the leaf axils [cf. 4979].

4981 Dionne, L. A.
Cytoplasmic sterility in derivatives of *Solanum demissum.*
Amer. Potato J. 1961 : **38** : 117–20.

A further account is provided of investigations already briefly described [2206].

4982 Starceva, L. I.
(The resistance of wild species and hybrids of potato to *Epilachna vigintioctomaculata* Mtsch. and diseases).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 128–37 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G500 : p. 49. [Russian].

Solanum polyadenium and *S. pinnatisectum* showed a high degree of resistance to *Epilachna* in studies of diverse material at the Far Eastern research station of the Institute of Plant Industry. *S. gibberulosum, S. schickii, S. subtilius, S. tarijense, S. chacoense* and *S. longipedicellatum* were resistant to *Epilachna* and *Phytophthora.* Selections among interspecific hybrids included forms combining resistance to *Epilachna* and diseases and early forms which escape attacks of *Epilachna.*

4983 Knutson, K. W. & Eide, C. J.
Parasitic aggressiveness in *Phytophthora infestans.*
Phytopathology 1961 : **51** : 286–90.

A study was made of (1) the effect of concentration of the inoculum on infection and (2) the relative speed with which different isolates penetrated and infected the host. The ratio of infection to concentration of sporangia in the inoculum suspension was fairly constant over a range of concentration of about 1200 to 21,000/ml., and did not differ greatly according to isolate. More than 12,000/ml. tended to obscure disparities between isolates, whereas less than 1200/ml. apparently increased the sampling error. In potato plants inoculated with sporangia in the greenhouse at 20° C., infection was first appreciable about 4 hours after inoculation. Number of infections per plant then increased with time. After 22 hours, some isolates, however, produced six times as many lesions as others. Differences in speed of infection between isolates of the same pathogenic race were just as great as those between isolates of different races. Speed of infection was not necessarily a function of rate of sporangial germination. The bearing of these findings on testing for field resistance to late blight is considered.

4984 GRAHAM, K. M., DIONNE, L. A. & HODGSON, W. A.
Mutability of *Phytophthora infestans* on blight-resistant selections of potato and tomato.
Phytopathology 1961 : **51** : 264–65.

It has been observed that *Ph. infestans* can sporulate on normally resistant potato plants during the "juvenile and senescent phases of growth." Utilizing these phases, cultures of certain races of the pathogen were grown alternately on susceptible and resistant varieties. A series of such alternate passages usually resulted in the appearance of a new race, capable of attacking the resistant variety at all stages of growth. Thus race 1,2,4 gave rise to races 1,2,3,4 and 1,2,4,5 after being grown for three generations on a variety with the genotype $R_1R_2R_3R_4$, while race 1,2,3,4 produced race 1,2,3,4,T_1 after seven generations on New Hampshire Cherry Tomato, which carries the gene PhT_1. It is suggested that "a few mutant nuclei in the mycelium may carry a factor for pathogenicity towards the resistant host. The physiological state of juvenile or senescent leaves that allows a saprophytic development of the fungus plus the selective effect of any 'residual' resistance upon the heterocaryon created by mutation, probably permits the survival of the appropriate race. Mutation of the original race to a wider host range may take place in one step, but in serial host passages it may be the result of step-mutations."

4985 BASTOS CRUZ, B. P.
Ocorrência de raças fisiológicas de *Phytophthora infestans*, agente causal da "requeima" da batatinha e tomateiro no Estado de São Paulo. **(The incidence of physiological races of *Ph. infestans*, causal agent of potato and tomato blight, in the State of São Paulo).**
Biológico 1961 : **27** : 40–41.

During 1958–59, the predominant races of *Ph. infestans* on potato were 4 and 1,4, while races 3 and 3,4 occurred most frequently on tomato.

4986 KRZYWAŃSKI, Z.
Badania nad fizjologicznymi przyczynami odporności liści ziemniaków na zarazę ziemniaczaną (*Phytophthora infestans* De By.). I. Charakterystyka przemian oddechowych liści dwóch odmian ziemniaków. **[Investigations on the physiological causes of the resistance of potato leaves to potato blight (*Ph. infestans* de Bary). I. The characteristics of respiratory exchange in the leaves of two potato varieties].**
Poznań. Towarz. Przyjaciół Nauk Wydział roln. leśn. Prace Kom. Nauk roln. leśn. 1960 : **7** : No. 6 : Pp. 27.

Only young leaves of the blight-resistant variety Epoka were sensitive to the respiratory inhibitors KCN, NaF and malachite green, while in the susceptible variety Katahdin leaves at all stages of development were more or less sensitive to all three inhibitors. Both varieties reacted similarly to diethyldithiocarbamate and thiourea and both showed similar changes in peroxidase activity during development. Catalase activity, however, increased with age in Epoka leaves but reached a peak early in development in Katahdin leaves.

4987 HAUSSDÖRFER, M.
Ein Beitrag zur Bestimmung der relativen *Phytophthora*-Resistenz der Kartoffel. **(A contribution to the determination of the relative resistance to *Phytophthora* of the potato).**
Wiss. Z. Univ. Rostock : Math.-Naturwiss. Reihe 1959–60 : **9** : p. 393.

The time-saving laboratory method described involves spraying detached leaflets with a suspension of zoospores; the intensity of sporulation is noted on the fourth and sixth days after infection. The maturity period is taken into account when comparing the resistance of varieties, for sporulation is greater on the early varieties than on the later ones.

4988 DUTT, B. L. & PUSHKARNATH
Resistance of potato varieties to powdery scab.
Indian Potato J. 1960 : **2** : 78–82.

Of 341 varieties examined, 72 were resistant, 90 moderately susceptible and 179 highly susceptible to *Spongospora subterranea*.

4989 SPRAU, F.
Über das Auftreten physiologischer Rassen beim Erreger des Kartoffelkrebses (*Synchytrium endobioticum* [Schilb.] Perc.). [**The occurrence of physiological races of potato wart (*S. endobioticum* [Schilb.] Perc.)**].
Prakt. Bl. PflBau 1960 : **55** : 161–67.

The discovery of wart biotypes in Germany and elsewhere and their classification are described and breeding for resistance in potatoes is also considered.

4990 ROTHACKER, D. & MÜLLER, W. A.
Arbeiten zur Züchtung krebsresistenter Kartoffeln. II. Untersuchung kultivierter südamerikanischer Kartoffelspecies auf ihr Verhalten gegenüber dem Krebsbiotyp G_1. (**Studies on breeding wart resistant potatoes. II. An investigation of cultivated South American potato species and their reaction to the wart biotype G_1**).
Züchter 1960 : **30** : 340–43.

Field and laboratory tests were carried out on 1687 potato genotypes using a strain of wart from Giessübel. The percentage of resistant genotypes was 25 for *Solanum tuberosum* ssp. *andigenum* and 13 for the 24-chromosome species.

4991 ULLRICH, J.
Kritische Bemerkungen zur Herkunft SB ("Rasse 3") des Kartoffelkrebserregers (*Synchytrium endobioticum*). [**Critical remarks on the strain SB ("race 3") of potato wart (*S. endobioticum*)**].
NachrBl. dtsch. PflSchDienst, Stuttgart 1961 : **13** : 10–11.

The strain SB was first reported in southern Czechoslovakia in 1942 but recent studies have provided no evidence of its existence. The potato varieties originally used to differentiate SB from race I either no longer exist or are unsuitable for race differentiation.

4992 MÜLLER, W.
Beitrag zur Methodik der Krebsresistenzprüfung bei Kartoffeln. (**A contribution to the methods of testing resistance to wart in potatoes**).
Wiss. Z. Univ. Rostock : Math.-Naturwiss. Reihe 1959–60 : **9** : p. 397.

The Dahlem procedure for testing resistance is criticized and a study of the factors influencing the results of infection reported. On the basis of these findings it was possible to carry out satisfactory infection experiments in all months of the year. It was also found that varieties which had slight susceptibility in laboratory experiments may be considered to be resistant.

4993 ULLRICH, J.
Die Beurteilung der Resistenz von Kartoffelsorten und Kartoffelzuchtstämmen gegenüber dem Erreger des Kartoffelkrebses (*Synchytrium endobioticum*). [**Judging the resistance of potato varieties and breeding strains to the cause of potato wart (*S. endobioticum*)**].
Züchter 1960 : **30** : 350–51.

Difficulties encountered in judging wart resistance are discussed and it is shown that Köhler's scheme is not generally satisfactory. At a conference of European specialists in Federal Germany, it was decided that varieties should only be designated wart resistant when no or only isolated sori of the pathogen completed development after artificial infection in the laboratory.

4994 KLEWITZ, R.
Die amtliche Kartoffelkrebsprüfung. (**Official testing for potato wart**).
Prakt. Bl. PflBau 1960 : **55** : 156–61.

The procedure used in West Germany for testing new varieties for resistance to wart is described.

1950–1960. Resultaten van tien jaar onderzoek. Werkgroep onderzoek bestrijding aardappelcystenaaltje. (**1950–1960. Results of ten years' investigations. Working party for investigations on the control of potato root eelworm**). Pp. 51.

4995 *Huijsman, C. A. Onderzoek over de resistentie van aardappelen tegen het aardappelcystenaaltje. (Investigations on the resistance of potatoes to the potato root eelworm). (pp. 16–21).*

While resistant material produces a hatching agent and is able to reduce an eelworm population by 70–90%, a residual population is usually left even after continued cultivation of resistant varieties. The resistance of *Solanum tuberosum* ssp. *andigenum* 'CPC1673' is dependent upon one dominant gene and that of *S. kurtzianum* upon two dominant polymeric genes, while that of *S. vernei* shows complex inheritance. The eelworm race B, which constitutes about 25% of Netherlands tested samples, is able to attack varieties derived from *S. andigenum*. There is also evidence of further races, which may be distinguished by the reactions of the differential species *S. famatinae*, *S. tuberosum* ssp. *andigenum* 'CPC 1673' and '1685', *S. nigrum*, *S.*

kurtzianum and *S. vernei*. *S. kurtzianum* has shown resistance to about 75% of race B and more than 95% of race A isolates collected in the Netherlands.

4996 *Toxopeus, H. J. & Huijsman, C. A. Het kweken van aaltjesresistente aardappelrassen op basis van* Solanum andigenum. (*The breeding of eelworm-resistant potato varieties on the basis of* S. andigenum). (*pp. 22–26*).

Resistant material derived from a back-crossing programme involving *S. andigenum* and *S. tuberosum* has been distributed to private breeders in the Netherlands for further breeding. Some of the material appears however to be susceptible to the new virus Y and to the new eelworm race.

4997 RADDATZ, E.
Nematodenbekämpfung durch resistente Kartoffelsorten. (**Nematode control by means of resistant potato varieties**).
Kartoffelbau 1961 : **12** : 113–14.

The resistant variety Antinema has a hatching effect upon cysts in the soil, but the hatched larvae die after penetrating into the roots; 96% disinfection has been achieved after one year's cultivation of Antinema, 99% after two and 99·9% after three. It appears from preliminary investigations that even in fields where new, infective, biotypes occur, these survive but do not multiply during the first year of cultivation of Antinema, although they are liable to increase in succeeding years of cultivation.

4998 EISENSCHMIDT, J.
Vergleichende Untersuchungen über das Verhalten von Larven und Imagines des Kartoffelkäfers (*Leptinotarsa decemlineata* Say.) gegenüber Wildkartoffeln und ihren Kreuzungen mit Kulturkartoffeln. [**Comparative investigations on the behaviour of larvae and imagines of the Colorado beetle (*L. decemlineata* Say.) towards wild potatoes and their hybrids with cultivated potatoes**].
Wiss. Z. Univ. Rostock : Math.-Naturwiss. Reihe 1959–60 : **9** : p. 395.

A positive correlation was found between susceptibility to the larvae and to the imagines. Resistance to the larvae depended on antibiosis, this effect being greater in *Solanum parodii* than in *S. commersonii*, but the last mentioned species was more repellent to the imagines. Since there has been no success so far in breeding potatoes resistant to both larvae and imagines, it is suggested that attempts be made to produce varieties susceptible to larvae but avoided by the imagines, *S. commersonii* being used in the breeding programme.

4999 BERCKS, R.
Das Verhalten von Kartoffelsorten gegenüber einer Infektion mit dem X-Virus aus der Sorte Erstling. (**The behaviour of potato varieties with respect to infection with virus X from the variety Erstling**).
Kartoffelbau 1961 : **12** : p. 102.

Of 80 varieties inoculated with the above race of virus X, 48 gave progeny which remained entirely or almost entirely free from symptoms.

5000 WETTER, C.
Über die X-Virus-Immunität der Kartoffelsorte Saphir. (**The immunity to virus X of the potato variety Saphir**).
Phytopath. Z. 1961 : **41** : 265–70.

Scions carrying virus X were grafted on to the German variety Saphir [Sapphire] but no viruses could then be isolated from the leaves or tubers of Saphir. Virus X was however isolated from the roots of 5 of the 40 grafted plants investigated. No hypersensitive reaction was observed in Saphir and it is suggested that the term immune be used to designate this type of resistance.

5001 ZALESKI, K., BŁASZCZAK, W. & SOSNA, Z.
Doświadczenia nad wirusowym wyradzaniem i odpornością na choroby wirusowe niektórych odmian ziemniaków uprawianych w Polsce. (**Experiments on virus degeneration and resistance to virus disease in some potato varieties grown in Poland**).
Roczn. Nauk rol. : Ser. A. 1961 : **83** : 444–61.

Of 11 potatoes subjected to virus infection for four successive years (1953–56) at Poznań-Sołacz, only Lenino resisted degeneration. During 1955–57, 20 varieties were tested for susceptibility to graft transmission of leaf mosaic and leaf roll. Lenino and Parnassia were the most resistant to mosaic, and moderate resistance to leaf roll was shown by Merkur, Wyszoborskie, Lenino and Parnassia.

5002 BAGNALL, R. H.
Recovery of virus X from leaves of graft-inoculated immune potato plants.
Phytopathology 1961 : **51** : 338–40.

USDA Seedling 41956 and some of its derivatives, including Saco and Tawa, are considered immune from virus X. At the Canada Department of Agriculture Research Station, Fredericton, evidence has been obtained that recoveries of virus X from graft-inoculated immune plants are in fact true recoveries and not contaminations. This evidence, together with observations by the author and other investigators on the necrotic lesions occasionally appearing on the leaves and tubers of so-called immune plants, leads the author to suggest that immunity from virus X is due to a type of hypersensitive response resulting in extreme localization. It is however considered that retention of the term immunity for this type of resistance is justifiable.

5003 Webb, R. E. & Schultz, E. S.
Resistance of *Solanum* species to potato viruses A, X and Y.
Amer. Potato J. 1961 : 38 : 137–42.

A report is given on the results of testing, by mechanical and graft inoculation, selections of several tuber-bearing species to one or more of the above viruses. Nine selections of *S. tuberosum* (*S. andigenum*), one of *S. maglia* and two "species hybrids" were resistant to both A and X. Two selections of *S. chacoense*, two of *S. hougasii*, three of *S. stoloniferum* and one species hybrid were resistant to both A and virus Y. No selection was highly resistant to all three viruses.

5004 Kollmer, G. F. & Larson, R. H.
Potato virus F in relation to host range, properties, reaction of American potato varieties, and resistance.
Res. Bull. Wisc. agric. Exp. Sta. 1960 : No. 223 : Pp. 40.

A detailed account is given of studies already briefly reported [2133].

Brandes, J., Bartels, R., Völk, J. & Wetter, C. (Editors).
Proceedings of the fourth conference on potato virus diseases at Braunschweig, 12–17 September, 1960.
Wageningen 1961 : Pp. 175.

5005 *van der Want, J. P. H. In memoriam Prof. Dr. T. H. Thung. (pp. 13–14).*

A short biography is given of Professor Thung, who organized these conferences on potato virus diseases.

5006 *Wiersema, H. T. Methods and means used in breeding potatoes with extreme resistance to viruses X and Y. (pp. 30–36).*

The seedling screening methods in use at the Plant Breeding Foundation, Wageningen, are described. USDA seedling 41956, *Solanum acaule* and *S. tuberosum* ssp. *andigenum* 'CPC1673' are being used as sources of resistance to virus X, and *S. stoloniferum* and *S. chacoense* for resistance to viruses Y and A.

In the discussion that followed, Ross reported that segregation data, while very limited, favour the assumption that X-immunity in 41956 stocks is controlled by a single dominant gene. Wiersema replied that his studies on 41956 also supported this assumption but that certain derivatives of this stock have given deficient numbers of resistant segregates.

5007 *Close, R. Selection of virus X-immune potato seedlings. (pp. 37–39).*

Tests on a series of X-immune, Y-resistant hybrids (the 119 series) which derive their X-immunity from USDA seedling 41956 and Y-resistance from Snowflake x Katahdin are reported; the series was developed by Hutton from his series-11 hybrids [cf. XXIII, 1307]. There was no top-necrotic reaction on grafting with virus A-infected scions; the tuber progenies appeared healthy but no tests were made for the presence of the virus. All the hybrids were susceptible to virus S and leaf roll. A method of eliminating seedlings which are symptomless carriers of virus X is described and its effectiveness illustrated with data from several crosses.

5008 *Ross, H. Über die Vererbung von Eigenschaften für Resistenz gegen das Y- und A-Virus in* Solanum stoloniferum *und die mögliche Bedeutung für eine allgemeine Genetik der Virusresistenz in* Solanum *sect.* Tuberarium. (*On the inheritance of properties of resistance to viruses Y and A in* S. stoloniferum *and its possible significance for the general genetics of virus resistance in* Solanum *sect.* Tuberarium). (*pp. 40–49*).

The series of genes or alleles conditioning resistance to Y in *S. stoloniferum* [cf. XXIX, 2841] appears also to govern resistance to A. Thus *Ry* determines immunity, *Ryn* hypersensitivity (local lesions without systemic infection for Y and local lesions followed by systemic infection for A) and *ry* susceptibility. A further gene occurring in some *S. stoloniferum* races is designated *Rym*; it reacts like *Ryn* with virus A and reacts with virus Y to produce mosaic accompanied by faint necroses. The order of dominance or epistasy is *Ry*>*Ryn*>*Rym*>*ry*. Similar genetic systems for virus resistance have been found in other species [cf. XXIX, 2840].

5009 *Beemster, A. B. R. Translocation of leaf roll and virus Y in the potato.* (*pp. 60–67*).
Inoculation tests of the resistant variety Bintje showed that, as was the case with virus X [cf. XXIX, 4082], resistance to translocation increases with increase in age at the time of inoculation. Mature-plant resistance was more pronounced in the case of virus Y than in the case of leaf roll.

5010 *Hamann, U. Resistenzeigenschaften verschiedener Kartoffelsorten gegenüber dem Blattrollvirus.* (*Resistance properties of different potato species with respect to leaf-roll virus*). (*pp. 68–75*).
Among six varieties studied, Fortuna and Apta were the most resistant to infection and rate of spread was lowest in Mittelfrühe [Medium Early], Aquila and Gülzow 633; extent of spread was greater in Mittelfrühe than in any other variety.
Resistance to infection appears to be the most important of the above components of resistance and some results of a method of testing for resistance to infection are presented for 21 varieties.

5011 *Hooker, W. J. & Fronek, F. R. The influence of virus Y infection on early blight susceptibility in potato.* (*pp. 76–81*).
Irish Cobbler plants infected with a non-necrotic strain of virus Y were more severely blighted than the virus-free controls. A similar association was noted in Green Mountain and Russet Rural varieties.

5012 *Bode, O. Prüfung der Resistenz von Kartoffelsorten gegen das Kartoffel-Y-Virus.* (*Test of the resistance of potato varieties to potato virus Y*). (*pp. 93–98*).
Varietal tests for resistance were carried out at Braunschweig, Germany, by growing rows of infected material among the test plants and subsequently testing the infectiveness of the sap in the greenhouse. The degree of infection varied with year but showed good correlations with field observations. Varietal differences in resistance were detected.

5013 *Nienhaus, F. Untersuchungen über Infektion, Vermehrung und Nachweis des Kartoffel-Y-Virus in Kartoffelknollen verschiedener Sorten.* (*Investigations on infection, multiplication and identification of potato virus Y in potato tubers of different varieties*). (*pp. 99–105*).
Of 38 varieties tested by tuber inoculation, only Delos remained uninfected by strain Y^N and only Delos and nine other varieties were uninfected by Y^R.

5014 FERNÁNDEZ VALIELA, M. V.
Comportamiento de la variedad Huinkul a virus "leaf roll" utilizando cuatro cepas de distinta procedencia. (**Response of the variety Huinkul to the leaf-roll virus using four strains of different origin**).
Idia 1961 : No. 158 : 1–4.
Variations in the symptoms induced by four virus strains on Huinkul potato plants are reported.

5015 BEEMSTER, A. B. R.
De mate van besmetting van aardappelknollen na inoculatie met X-virus op verschillende aantallen bladeren. (**The degree of infection of potato tubers after inoculation of different numbers of leaves with virus X**).
Meded. LandbHogesch. Gent 1960 : **25** : 1140–47.
Inoculation of only one leaf results in a lower percentage of tuber infection than inoculation of two or three successive leaves, the latter two treatments giving equal percentages. When only the first and last of three successive leaves are inoculated, the infection percentage is approximately the same as that of a single-leaf inoculation.

5016 SINGH, M. P. & SHRIVASTAVA, S. N.
Performance of cross 4 sweet-potato (*Ipomea batatas* Lamk.) variety against the parents.
Sci. & Cult. 1960 : **26** : p. 288.
Cross 4 (local selection L_1 x American variety Ranger) has on the average given increases in yield of 102·3% and 173·9% over Ranger and L_1, respectively, in trials during 1953–57 at the Agricultural Research Institute, Sabour, Bihar. Its high yield is presumably the result of hybrid vigour.

5017 LOEBIS, A. T.
Seleksi ubi djalar (*Ipomoea batatas* Poir). [**Selection of sweet potato (*I. batatas* Poir)**].
Tehn. Pertanian 1954 : **3** : 314–25.
In this outline of objectives and methods in Indonesia, it is mentioned that varieties 3, 179 and 40 have done well in highland areas, 15 and 31 are suited to lower-lying districts and 110 is adapted to both types of country.

5018 Nishiyama, I., Fujise, K., Teramura, T. & Miyazaki, T.
(Studies on sweet potato and related plants. I. A comparative study of chromosome number and the principal characters of section Batatas).
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 37–43. [Japanese].

Morphological and cytological descriptions are given of some recently collected *Ipomoea* spp. [cf. XXX, 2898]. The following chromosome numbers are reported: *I. batatas* and *I. trifida*, $2n = 90$; *I. triloba* and *I. liliacea*, 30; and *I. gracilis*, 60*. Meiosis in *I. trifida* and *I. gracilis* was quite regular, 45_{II} and 30_{II} respectively being formed.

FIBRES

5019 Dadabaev, A. D.
(The most important problems of cotton production in the USSR).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 1 : 23–27. [Russian].

Introduction of recent Soviet varieties distinguished by earliness, high yield, wilt resistance and high quality of fibre is among the topics discussed. Among the new varieties with a short growth period, some are 15–20 days earlier than 108F, while others approximate it in growth period but are more productive. Some varieties have fibre 34–36 mm. long and ginning percentages of 40–42%. A number of varieties have fine fibre and one variety has nonfuzzy seed.

5020 Walton, P. D.
Cotton variety trials in the northern and eastern provinces of Uganda, 1957–60.
Emp. Cott. Gr. Rev. 1961 : **38** : 81–91.

The Northern and Eastern Provinces are commonly described as the "S47 area", in contrast to the "BP52 area", comprising the Buganda and Western Provinces. Trials are reported which were undertaken to ascertain whether it would be desirable to extend the area of cultivation of BP52 in the Northern and Eastern Provinces, pending the availability of improved varieties developed at Serere. The results have led to the conclusion that seed issue of BP52 over the whole of the two provinces would increase the value of the crop even in unfavourable years.

5021 Peat, J. E. & Brown, K. J.
A record of cotton breeding for the Lake Province of Tanganyika: Seasons 1939–40 to 1957–8.
Emp. J. exp. Agric. 1961 : **29** : No. 114 : 119–35.

Breeding and the gains in yield accruing from this project in the Lake Province are reviewed and discussed at length. The valuable results derived from primary single-plant selection and reselection of Mwanza Local are an outstanding feature of the work. Lines developed in this way have been used in successive multiline issues.

5022 Hughes, L. C.
A visit to the United States cotton belt, September–October, 1960.
Emp. Cott. Gr. Rev. 1961 : **38** : 119–26.

The author gives an account of current work on cotton, discussing projects on breeding, genetics and cytology. Laboratory and commercial testing of lint quality are also considered.

5023 **Review of work done under the Indian Central Cotton Committee's schemes during 1958–59.**
Indian Cott. Gr. Rev. 1960 : **14** : 234–47.

Information is provided on breeding, selection and varietal testing carried out in various Indian States during 1958–59 [cf. XXX, 2909].

5024 Ganesan, D.
Evaluation of methods of cotton breeding.
Indian Cott. Gr. Rev. 1960 : **14** : 189–91.

Selection in 3–4 successive generations derived from CTI 1, 3 and 4, interspecific hybrids of unspecified origin, resulted in substantial improvements in fibre length, fibre weight and Pressley index. The value of reselection within established commercial lines is emphasized.

5025 Varuntsyan, I.
Cotton growing in the U.S.S.R.
Indian Cott. Gr. Rev. 1959 : **13** : 416–20.

The role of breeding and selection in the development of cotton growing in the Soviet Union is discussed. The varieties 108F, 1298, 213 and 8763.1 are described briefly.

5026 Ganga Prasad Rao, N.
Preliminary studies in breeding a long staple Gaorani cotton.
Indian Cott. Gr. Rev. 1960 : **14** : 19–22.

At the Plant Breeding Station, Mudhol, Bombay State, 29 Gaorani progenies with fibre length between 1·00″ and 1·07″ were selected. Studies of the fibre characteristics of these progenies showed that seven possessed an optimum combination of fibre length, strength and fineness.

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* Cited, presumably by oversight, as 30 in Table 1.

"A detailed study of the progeny means for yield and some of its components revealed significant differences in respect of plant height, boll number, ginning per cent, seed weight and monopodials. Emphasis is laid on keeping the broad base concept in breeding a long staple Gaorani cotton so that the ultimate yields are not adversely affected.

"The enormous amount of variation in Gaorani strains was brought out; the occurrence of some genetically unbalanced types in natural populations warrants a study of their genetical and cytogenetical behaviour which is expected to throw considerable light on the origin and evolution of these superior Gaoranis."

5027 IYENGAR, R. L. N. & PILLAY, K. P. R.
Reduction of neps in standard Indian cottons.
Indian Cott. Gr. Rev. 1960 : **13** : 403–08.

As a result of a selection programme at the Technological Laboratory, Matunga, *Gossypium herbaceum* and *G. hirsutum* lines having considerably less neps per g. than the parent varieties have been developed. In the case of *G. arboreum* varieties, selection for low nep count was, in general, unsuccessful.

5028 VENKATARAMAN, N.
A note on the evolution of the long linted cottons for the rice fallows in the Madras State.
Madras agric. J. 1961 : **48** : 89–92.

A report is given on progress achieved at the Agricultural Research Station, Aduthurai, in developing a short-duration variety of *Gossypium hirsutum* for growing between rice crops, improvements in lint length, ginning outturn and spinning performance over P216F being desired. Selection of existing varieties and of Coker x AC107 has resulted in cultures showing promise of fulfilling this requirement, as well as being much more productive than P216F.

5029 Activité de l'I.R.C.T. 1958. **(The work of the Institute for Research on Cotton and Exotic Textiles, 1958).**
Cot. et. Fibr. trop. 1960 : **15** : 151–365.

This report deals primarily with cotton breeding and varietal testing in Sudan, Cameroon and Togoland as well as the areas named below; work on *Urena*, *Hibiscus* and sisal is also mentioned.

Central African Republic

Breeding for resistance to *Xanthomonas malvacearum*, *Fusarium oxysporum* f. *vasinfectum* and *Empoasca facialis* has continued [cf. XXIX, 4092]. Sixteen Reba lines, resistant to all three pathogens, have been developed and are being studied further. The results of varietal trials at the Bambari and Bossangoa stations and at other localities are reported. Among lines which showed promise were Reba W296, Soumbé A25B9, TK1, B185 (Banda x NA42–5) and B185E40.

Chad

As well as varietal trials, attempts to develop hybrid lines by making use of chemically induced and genetic male sterility are reported. Investigations on the genetic control of absence of gossypol glands have been conducted. Completely glandless lines, carrying *gl–l* and an unidentified dominant gene, were obtained from Stoneville, Miss., USA, and crossed with local lines. Breeding for absence of nectaries is also in progress. A systematic search for haploids in cotton populations at the Bebedjic and Tikem stations resulted in the isolation of 33 *n* plants.

Republic of the Congo

Progress in the development of an *Hibiscus cannabinus* line ripening in midseason is reported.

Ivory Coast

Selection and hybridization of *Gossypium barbadense* populations at the Bouaké station has continued. The programme of the cytogenetics section at Bouaké is described. The progeny of a triple hybrid, possessing 26 chromosomes from *G. hirsutum*, 15 from *G. arboreum* and 15 from *G. raimondii*, is being studied. Lines with fibre length more than 30% greater than in the parent Upland lines, Acala 4–42 and 1517C, have been obtained, as well as lines with a Pressley index of 10·7. Progress is also reported with respect to maturation period, and drought and disease resistance. "Hexaploid" hybrids, in which 52 chromosomes from either *G. hirsutum* or *G. barbadense* are associated with 26 *G. anomalum* chromosomes, have shown some promising features. Absence of bracts has been shown to increase resistance to parasitism by *Platyedra gossypiella* on the cotton boll. Standard lines have now been hybridized with *G. armourianum*, which has drooping bracts, and with *G. acerifolium* (vestigial bracts).

North Africa

Detailed information is provided on the technological characteristics of lines derived from various intervarietal crosses, in Morocco and

Algeria. The results of varietal trials, involving local and introduced varieties, are reported.

5030 Marani, A.

Inheritance of yield components in a diallel cross of cotton.

Bull. Res. Counc. Israel 1961 : **9D** : 195–96. (Abst.).

Gossypium hirsutum 'Acala 4/42', 'Coker 100A' and 'Empire' and *G. barbadense* 'Pima 32', 'Pima S–1' and 'Ashmouni' were crossed in all possible combinations. The F_1s and parents were then compared in a Youden square with five replicates. A strong heterotic effect, usually more pronounced in interspecific crosses, was observed in date of first flower, plant height, yield of seed cotton, lint yield and seed index. Characters such as mean maturity date, boll weight and lint index, however, showed heterosis in intraspecific crosses, F_1s from interspecific crosses being intermediate for these characters. Lint outturn was higher than the parental mean in F_1s from intraspecific crosses but in F_1s of interspecific crosses was below that of the parent with the lowest value in this respect. The data were studied by the method of diallel-cross analysis proposed by Hayman and by Jinks. Overdominance was found for yield of seed cotton and height, complete dominance for lodging resistance and partial dominance for boll weight and mean maturity date. The *G. hirsutum* varieties used as parents showed dominance in date of first flower and yield of seed cotton, and the *G. barbadense* varieties dominance in height, lodging resistance and lint outturn.

5031 Waddle, B. M., Lewis, C. F. & Richmond, T. R.

The genetics of flowering response in cotton. III. Fruiting behaviour of *Gossypium hirsutum* race *latifolium* in a cross with a variety of cultivated American upland cotton.

Genetics 1961 : **46** : 427–37.

The three stocks of race *latifolium* used in this study at the Texas Agricultural Experiment Station were two short-day introductions from Guatemala and an inbred of day-neutral Deltapine 14. In preliminary greenhouse experiments, the short-day stocks in the naturally short days of winter developed flowers and initiated fruit forms ("squares") in about the same length of time as the day-neutral stock. In the longer days of summer, the short-day introductions failed to flower, whereas Deltapine 14 flowered profusely under both long and short-day conditions. By artificially shortening the photoperiod to 10 hours, the short-day cottons were induced to flower and square sporadically during the summer, but flowering was markedly delayed. The short-day stocks were crossed with Deltapine 14 in the greenhouse during winter. The parents, F_1s, F_2s and backcrosses were grown in (1) the field during summer 1951 under long-day conditions (13–14 hr.) and (2) the greenhouse during winter under short-day conditions (9–10 hr.). In 1952, the field plantings were repeated and progeny tests made of previous selected F_2 and back-cross segregates. The short-day and day-neutral responses were shown to be primarily under genetic control. No classic Mendelian ratio could be detected but the day-neutral reaction was partially dominant. Other environmental factors, particularly temperature, modified the photoperiodic response of the short-day stocks, cooler temperatures tending to promote flowering, even under natural long-day conditions, as was the case in a test of one of the short-day stocks in 1953 at Shafter, Calif. The investigation indicates that the short-day response in itself does not prevent use of cottons introduced from the tropics in breeding in the temperate zone, since the nonflowering habit may be eliminated in segregating generations when crosses are made with day-neutral stocks. [Cf. XXVIII, 1890; XXX, 4105].

5032 **What the scientists are doing? Hybrid cotton—a new venture.**

Indian Cott. Gr. Rev. 1960 : **14** : 342–43.

The potentialities of F_1 hybrid cotton in India are discussed briefly. Mention is made of studies in Gujarat on the male-sterility inducing agent sodium α,β-dichloroisobutyrate (FW450).

5033 Joshi, A. B., Bhale, N. L. & Pathak, S. G.

Heterosis and its exploitation in cotton improvement—intra-*hirsutum* crosses.

Indian Cott. Gr. Rev. 1960 : **14** : 1–5.

A number of intervarietal *Gossypium hirsutum* hybrids, notably H14 x AC91 and Co.2 x 216F, were superior in yield and staple length to the standard varieties H14 and 216F. Problems involved in the production of hybrid cotton seed are discussed briefly.

5034 Joshi, A. B. & Hardas, M. W.

Cotton improvement through interspecific hybridization and the role of wild germ-plasm.

Indian Cott. Gr. Rev. 1960 : **14** : 82–88.

The economically important characters of nine wild *Gossypium* species and the possibilities of utilizing these in crosses with cultivated forms are discussed in this review. Reference is made to the potential value of irradiation techniques for obtaining monosomics and for the induction of desirable deletions and translocations in chromosomes in hybrid material.

5035 Kammacher, P.
Sur les phénomènes de ségrégation chromosomique observés à la méiose du tétraploide synthétique (*Gossypium hirsutum* x *G. arboreum*) x *G. raimondii* et de ses descendances. [**On the phenomena of chromosomal segregation observed at meiosis in the synthetic tetraploid (*G. hirsutum* x *G. arboreum*) x *G. raimondii* and in its descendants**].
Ann. Génét. 1961 : **2** : 59–68.

The most frequent configuration observed was $21_{II} + 1_{IV} + 1_{VI}$, the hybrid being heterozygous for two reciprocal translocations, one in genome A and the other in genome D. The configurations observed when the hybrid was back crossed to *G. hirsutum* were all attributable to the segregation of the chromosomes involved in the translocations.

5036 Ganga Prasad Rao, N.
Some perennial cottons of Raichur and their utilisation in cotton breeding under the Tungabhadra Project.
Indian Cott. Gr. Rev. 1960 : **14** : 183–88.

Two perennial forms, one referred to as Raichur *Gossypium barbadense* (RB) and the other as Lingsgur tree cotton, (LT) were crossed with the *G. hirsutum* varieties Laxmi, HA11, 1821–1–1, 2196–4 and Co.2. A high degree of hybrid vigour was shown by the F_1 progeny derived from these crosses; crosses involving LT appeared to be superior in quality to those involving RB. A number of F_4 segregates, derived from Laxmi x RB and HA11 x RB, were superior in yielding ability and staple length to Laxmi. Single plants with halo lengths of 28–31 mm. were isolated and will be studied further.

5037 **Better cottons ahead.**
Agric. Res., Wash. 1961 : **9** : No. 9 : 8–9.

A method of embryo culture in which the osmotic pressure of the medium is controlled has given a high degree of success in hybridization between wild and cultivated cottons. The embryos were first cultured at an osmotic pressure of 10 atmospheres, use being made of a modified White's medium to which an extra 0·7% of table salt had been added. After 3–4 weeks, the embryos were transferred to a 6-atm. solution. After a further 2 weeks, they were transferred to a 3-atm. solution, in which the embryos germinated. The embryos developed chlorophyll faster when exposed to about 100 foot candles of fluorescent light, a temperature of about 90° F. being best for normal growth. The initial high osmotic pressure prevented severe shock to immature embryos just removed from their environment with a naturally high osmotic pressure. It also promoted orderly development and differentiation and prevented premature germination.

5038 Saunders, J. H.
A re-examination of a species of the genus *Notoxylinon*.
Emp. Cott. Gr. Rev. 1961 : **38** : 103–05.

Seed was obtained from *Gossypium sturtii* ♀ x *N. australe* ♂ at Shambat, Sudan, but not from the reciprocal. Morphological observations are reported on the F_1 hybrids and back crosses to both parents. Of the 14 PMCs examined at metaphase I in F_1 plants, 12 contained 13_{II} and the remaining 2 either 13_{II} or $11_{II} + 1_{IV}$. Because of the crossability of *N. australe* with *G. sturtii* and the cytological evidence from the F_1 hybrids, it is suggested that the former species should be designated *Gossypium australe* and assigned to genome C under the symbol C_3.

5039 Cruz, R. D., Chakravarty, K. & Jadhav, A. S.
Allopolyploidy in Gossypium.
Sci. & Cult. 1960 : **26** : p. 278.

The following chromosome configurations are reported, as the result of investigations at the Poona College of Agriculture: *G. hirsutum*, $0{\cdot}70_{IV} + 24{\cdot}60_{II}$; *G. barbadense*, $0{\cdot}05_{IV} + 25{\cdot}90_{II}$; the F_1 hybrid between these species, $0{\cdot}42_{IV} + 25{\cdot}16_{II}$; and the allopolyploid, $11{\cdot}66_{IV} + 0{\cdot}12_{VI} + 2{\cdot}44_{VIII} + 0{\cdot}64_{I} + 18{\cdot}24_{II}$. At anaphase I in the allopolyploid, the number of chromosomes passing to each pole ranged from 48 to 56. Meiotic irregularity caused a considerable amount of sterility and boll shedding in the allopolyploid.

5040 Abdullaev, G.
(The problem of improving cold resistance and earliness in cotton).
Socialist. sel'skohozjajstv. Azerbajdžan. (Socialist Agric. Azerbaijan) 1959 : No. 12 : 16–20 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G283 : p. 28. [Russian].

Heritable changes in earliness and yield were obtained in cotton in Azerbaijan by applying alternating temperatures to the seed.

5041 Rotač, N. S. & Tardžemanov, I. K.
(Introduce the new cotton variety 149F into production with more confidence).
Hlopkovodstvo (Cotton Growing) 1960 : No. 4 : 22–23. [Russian].

This high-yielding variety, which matures 3–4 days earlier than 108F, is recommended for cultivation in various districts in Uzbekistan.

5042 Joshi, N. V.
Review of Mathio cotton improvement scheme in Saurashtra.
Indian Cott. Gr. Rev. 1960 : **14** : 192–98.

Sanjay (CJ73), a C520 x Jarila cross maturing eight days earlier than Pratap [cf. XVI, 60], was released in 1958 as a replacement for Pratap in the Mathio cotton tract. Sanjay proved superior to Pratap and Mathio local in a series of trials at Amreli, Saurashtra. Mention is made of a number of synthetic lines superior to Sanjay in ginning outturn and fibre length.

5043 Gupta, P. S. & Sharma, R. P.
A new *desi* cotton variety tolerant to heavy rains.
Indian Cott. Gr. Rev. 1960 : **14** : 425–27.

An unnamed 35/4 x Parb. G703 selection yielded about one-fifth more than 35/1 under conditions of heavy rainfall. Under normal weather conditions, both varieties gave similar yields. The new variety, which proved superior in quality to 35/1 in mill tests in 1958, is recommended for cultivation in the western part of Uttar Pradesh.

5044 Neelakantan, L., Kamalanthan, S. & Nagarajan, C.
Progress of cotton research in the irrigated Cambodia zone of Madras State.
Indian Cott. Gr. Rev. 1960 : **14** : 6–13.

Detailed information is provided on the development of 9030G, a new, long-staple, American-type variety bred by the Department of Agriculture, Madras. The new variety, which is now named MCU3 (Pongal), proved superior to the standard variety MCU1 in a large number of trials conducted between 1954 and 1959. The Indian Central Cotton Committee has recommended that the new variety should replace MCU1 in the Irrigated Winter Cambodia Zone of Madras State. Reference is made to a number of other promising new lines.

5045 Saharova, G. A.
(An early-maturing cotton variety).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 3 : 64–65. [Russian].

The variety described, S–4727, matures 10 days before 108–F in Turkmenia, where it has given a total yield of 38·3 c. per ha. compared with 28·2 c. from 108–F, which it excels also in lint length and ginning percentage.

5046 Annappan, R. S.
PK.924—a new culture of promise for the winter Cambodia zone in Madras State.
Indian Cott. Gr. Rev. 1960 : **14** : p. 341.

PK924 was isolated from the advanced-generation progeny of a multiple interspecific hybrid derived from Coimbatore, African and Russian *Gossypium hirsutum* varieties and Egyptian *G. barbadense* lines. In trials held in 1955–59, PK924 was approximately equal to MCU1 in yielding ability and staple length and superior to it in fibre fineness, strength and spinning performance.

5047 Iyengar, R. L. N. & Hari Rao Navkal
A study of Mysore cottons from the technological characters.
Indian Cott. Gr. Rev. 1960 : **14** : 410–12.

The technological characteristics of *Gossypium hirsutum* 'MA5', 'Laxmi' and '2196–4', *G. herbaceum* 'Jayadhar' and '5117' and a number of interspecific hybrids are briefly discussed.

5048 Staten, G.
Acala 1517D, a new high quality cotton variety for New Mexico.
Res. Rep. N. Mex. agric. Exp. Sta. undated : No. 49 : Pp. 8. (Mimeographed).

Acala 1517D, developed from a cross between two experimental strains of Acala, has been released in New Mexico as a substitute for Acala 1517C, since it shows improvements in fibre properties and spinning performance over this variety. Like 1517C, Acala 1517D is susceptible to races 1 and 2 of *Xanthomonas malvacearum*. Both varieties are classified as moderately tolerant of *Verticillium* wilt.

5049 Poruckij, G. V., Olejničenko, V. V. & Halabuda, L. P.
(Physiology and anatomy of the Ukrainian cotton ecotypes).
Nauč. Trud. ukrain. nauč.-issled. Inst. Fiziol. Rast. (Sci. Trans. Ukr. sci.-res. Inst. Pl. Physiol.) 1958 : No. **13–14** : 109–36 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G589 : p. 57. [Russian].

Physiological and anatomical descriptions of plain and montane ecotypes are given.

5050 Kimber, G.
The association of chromosomes in haploid cotton.
Heredity 1960 : **15** : p. 453. (Abst.).

The evidence from polyhaploids and from certain interspecific hybrids within *Gossypium* points to the possibility of genetic control of intergenomic pairing, similar to that in *Triticum aestivum.* Earlier data on *Nicotiana tabacum* hybrids may be interpreted in a similar fashion. The genetic control of cytologically diploid behaviour in allopolyploids may thus be a frequent occurrence.

5051 Jagathesan, D. & Swaminathan, M. S.
Viability and fertility of monosomics in *Gossypium hirsutum.*
Curr. Sci. 1961 : **30** : p. 155.

One plant with $2n = 51$ occurred among plants raised from seeds treated with 60,000 r. of X rays. Although vigorous, the plant was completely sterile. During meiosis in the PMCs, $25_{II} + 1$ large univalent were formed. The mean chiasma frequency per bivalent was 1·50 in the monosomic and 2·26 in normal plants. The univalent belonged to genome A, as indicated by its size. It usually lagged and divided at anaphase I.

5052 Meyer, J. R. & Meyer, V. G.
Origin and inheritance of nectariless cotton.
Crop Sci. 1961 : **1** : 167–69.

The absence of leaf and extrafloral nectaries, which characterizes *Gossypium tomentosum*, is conditioned by two recessive genes designated *ne*–1 and *ne*–2. The character is being transferred to Upland cottons.

5053 Bird, L. S. & Ergle, D. R.
Seedling growth differences of several cotton varieties and the influence of gibberellin.
Agron. J. 1961 : **53** : 171–72.

The 12 varieties studied differed significantly in rate of seedling emergence and seedling height. The two measurements were positively associated, suggesting that rapidly emerging varieties may be developed by selecting only for seedling height. As indicated by seedling height, the varieties differed in response to treatment of the seeds with potassium gibberellate.

5054 Varuncjan, I. S.
(Intravarietal hybridization in cotton seed production).
Hlopkovodstvo (Cotton Growing) 1960 : No. 1 : 26–27. [Russian].

In reply to Ljackij, Varuncjan restates the Mičurinist view that intravarietal hybridization prevents the physiological deterioration of cotton varieties which results from continued self pollination [cf. 3582]. The importance of using large amounts of pollen in intravarietal hybridization and employing material grown in different environments is emphasized. Variability, sometimes observed in a cotton variety reproduced by the above method, is attributed to fertilization by a small amount of pollen.

5055 Lalaev, G. B.
(Some problems of cotton seed production).
Izv. Min. sel'sk. Hoz. Arm. SSR (News Min. Agric. Arm. SSSR) 1960 : No. 2 : 59–67 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G663 : p. 61. [Russian].

A modified method of intravarietal pollination which has improved earliness, yield and lint length in varieties 1298 and 108F is described.

5056 Venkata Reddy, J., Appa Rao, P. & Mahaboob Ali, S.
A preliminary note on the introduction of suitable marker genes for the maintenance of purity of Cocanadas–2.
Indian Cott. Gr. Rev. 1960 : **14** : 322–23.

The cotton variety Cocanadas–1 is easily distinguished on account of its buff-coloured pollen. Attempts are now being made to transfer this character, which is controlled by a simple recessive, to Cocanadas–2.

5057 Milkovskij, I.
(The technological quality of Bulgarian cotton varieties).
Hlopkovodstvo (Cotton Growing) 1960 : No. 4 : 55–57. [Russian].

An extended version of this article has already been summarized [cf. XXIX, 4135 and 4125].

5058 Gursham Singh, Ajaib Singh Aujla & Geo Paul, N.
Genetical selection for high Pressley Index in Punjab long linted strains.
Indian Cott. Gr. Rev. 1960 : **14** : 175–77.

Selection of seven long-linted strains on the basis of high Pressley strength index is reported. Statistical calculations indicated that the correlation coefficient relating halo length and Pressley index was significant between varieties and between plants within varieties.

5059 JUNKEN, E. R.
Contenido proteico en fibra de algodones argentinos. (**Protein content in the fibre of Argentine cottons**).
Rev. Invest. agríc. B. Aires 1961 : **15** : 153–56.

Details are given of the protein content and specific area of the fibre in 15 cotton lines, tested during 1957–58.

5060 IYENGAR, R. L. N. & VENKATARAMAN, V.
Comparative mill and laboratory tests on improved varieties and trade varieties of Indian cottons.
Indian Cott. Gr. Rev. 1959 : **13** : 409–15.

Tabulated data on the fibre quality and spinning performance of 49 cotton lines are provided.

5061 JOSHI, A. B., CHAVDA, D. H. & SATYANARAYANA, K. V.
A study of characters contributing to ginning out-turn in some varieties of *Gossypium hirsutum* L.
Indian Cott. Gr. Rev. 1960 : **14** : 373–80.

Five component factors contributing to ginning outturn and lint index were estimated in a group of five American, five Russian and six indigenous lines; appropriate correlation coefficients were also calculated. The data indicated that fibre density was the most important of the factors, there being a high, positive correlation between it and both ginning outturn and lint index. It is recommended that this component be given the maximum attention in the breeding of higher-quality cotton. Significant positive correlations were also obtained between ginning outturn and two other components, mean fibre weight and seed index, and between lint index and the same two components. Mean fibre length appeared to have no significant influence on either of the two main characters. The American line SA463 and the Russian line K3814 showed promise as potential breeding stocks.

5062 NILES, G. A.
A comparison of F_2 distributions of certain economic characters in crosses of six "foreign" cotton stocks with an American upland tester stock.
Diss. Agric. Mech. Coll. Texas 1959 : Pp. 78. (Mimeographed).

The F_2 populations from crosses of six imported *Gossypium hirsutum* strains with an American upland tester strain were evaluated for flowering date, lint percentage, boll size and fibre length, strength and fineness. All characters, except flowering date in one cross, were inherited quantitatively; in the atypical cross, flowering behaviour in the F_2 suggested some kind of gametic selection in the F_1. Dominance effects were noted for early flowering, long fibres and high fibre strength. Evidence of transgressive inheritance was most marked in the case of fibre length and strength. Theoretical arithmetic and geometric means were calculated but failed to indicate a predominant mode of gene action. In four of the crosses, the F_1 populations showed heterosis for fibre length and boll size. Consistent negative correlations were found between lint percentage and fibre length and between fibre length and fibre fineness. Positive associations occurred between lint percentage and fibre fineness; boll size and fibre length; boll size and fibre strength; fibre length and strength; and fibre fineness and strength. Heritability estimates were highest for fibre length, averaging 64% for all crosses. The lowest estimates were obtained for fibre fineness (average 30%). Heritabilities for the other characters were inconsistent but were generally high enough to suggest that they may be susceptible to selection. The possibility of using the six stocks in improving American Upland cottons is discussed.

5063 GUPTE, V. V. & IYENGAR, R. L. N.
Combing of Indian and African (Kampala) cottons.
Indian Cott. Gr. Rev. 1960 : **14** : 96–125.

Detailed studies of the industrial characteristics of Kampala and ten Indian cotton varieties are reported.

5064 INNES, N. L.
Breeding bacterial blight resistant cotton in the Sudan by combining greenhouse inoculation with field spraying.
Emp. Cott. Gr. Rev. 1961 : **38** : 92–100.

In breeding for resistance to *Xanthomonas malvacearum* at Shambat, Sudan, needle inoculation of the main vein of the leaf under greenhouse conditions has proved to be a useful supplementary procedure in transferring the modifier B_{6m} by itself and B_2B_{6m}. Detailed information is provided on the programme of breeding and of greenhouse and field screening used in synthesizing B_{6m} and B_2B_{6m} strains. The technique of vein inoculation also has a limited application in differentiating between

B_2 and B_2B_3 types. At Shambat, using this method, it has been possible to distinguish between homozygotes for B_2 and B_2B_3 on the basis of mean lesion length, but in segregating progenies this distinction has not been possible. Environmental changes appear to influence the disparity between B_2 and B_2B_3 resistance, since the difference between mean lesion length of the B_2 and B_2B_3 Sakel controls varied from experiment to experiment at Shambat, but at Wad Medani no difference was observed with vein inoculation. In the field, B_2B_3 resistance is more effective than the B_2 type and, until B_2B_{6m} strains are available for commercial production, it is important to obtain the maximum degree of B_2B_3 resistance. This may be achieved by selfing after each backcross generation and selecting plants with maximum resistance for further back crossing. As a safeguard against the appearance of other more virulent races, it is desirable to select for maximum resistance within the genotype B_2B_{6m} and to synthesize strains homozygous for other combinations of B genes, such as $B_2B_4B_{6m}$. Both these measures are receiving attention at Shambat.

5065 BRINKERHOFF, L. A. & HUNTER, R. E.
Frequency of cotton plants resistant to *Fusarium* wilt in some lines of cotton resistant or susceptible to bacterial blight.
Plant Dis. Reptr. 1961 : **45** : 126–27.

Nine varieties resistant to *Xanthomonas malvacearum* were compared with four susceptible varieties for reaction to *F. oxysporum* f. *vasinfectum*. Generally, the varieties which were resistant to bacterial blight also had a higher percentage of plants resistant to *Fusarium* wilt; limited observations suggest that injury due to *Meloidogyne incognita acrita* was also less severe in the resistant varieties.

5066 AVTONOMOV, A. A.
(A new method of assessing breeding material for resistance to *Fusarium* wilt).
Hlopkovodstvo (Cotton Growing) 1960 : No. 2 : 18–19. [Russian].

Cotton plants under study are grown until 2–3 bolls appear. The bolls are removed and sun-dried for two days, after which the seeds are sown in large pots containing 100 g. of *Fusarium*-infected oats. Susceptible plants may be identified at the cotyledonary or the 2–3-leaf stage. A number of (C2515 x C1451) x 6015 and C2283 x 6013 selections showed resistance to the pathogen in tests conducted in 959 at the All-Union Cotton Institute.

5067 VENKATA REDDI, J. & RANGANADHACHARYULU, N.
Preliminary trials for control of mildew disease on cotton.
Indian Cott. Gr. Rev. 1960 : **14** : 147–48.

The varieties 720, 122 and 479F showed more resistance to *Ramularia areola* than nine other lines, in a trial conducted at the Government Cotton Farm, Narasaraopet.

5068 GURSHAM SINGH & AJAIB SINGH AUJLA
Breeding of extra-long staple cotton strains resistant to jassid in the Punjab.
Indian Cott. Gr. Rev. 1959 : **13** : 433–35.

Resistance to *Empoasca devastans* was successfully transferred from the Madras and Surat types of cotton to a group of American varieties at the Cotton Research Station, Abohar. Highest resistance to the insect was found in six lines derived from the cross (45F x LSS) x 415/49 (Madras type).

5069 REED, D. K. & ADKISSON, P. L.
Short-day cotton stocks as possible sources of host plant resistance to the pink bollworm.
J. econ. Ent. 1961 : **54** : 484–86.

Use was made of an improved procedure, involving transference of newly hatched larvae, instead of eggs, to the bolls, in testing (1) an introduction of *G. hirsutum* race *latifolium* from Guatemala, (2) *G. barbadense* 'Lengupa', indigenous to Bolivia and Colombia, (3) *G. hirsutum* race *palmeri* and (4) *G. hirsutum* race *marie-galante* for reaction to pink bollworm (*Platyedra gossypiella*) at the Texas Agricultural Experiment Station. With the exception of (1), which is day neutral, the plants are short-day types; (1) and (2) proved to be susceptible, and (3) and (4) resistant. Race *marie-galante* was chosen for further study. Its resistance was apparently mainly due to the extensive proliferation of tissue in the infested bolls, which crushed, trapped or so injured the young larvae that death ensued. The resistance of race *marie-galante* was categorized as antibiosis. Observations on F_1 race *marie-galante* x (susceptible) race *latifolium* 'Deltapine 15' suggested that resistance was partially dominant. Work by other investigators [XXVIII, 1890, XXXI, 5031] has indicated that the short-day response does not in itself prevent use of cottons with this reaction in breeding programmes in temperate countries. Crosses of race *marie-galante* with Upland and back crosses have been made to explore the value of this race in breeding for pink-bollworm resistance.

5070 Dadabaev, A. D. & Simonguljan, N. G.
(Cotton varieties with a determinate compact branching habit).
Hlopkovodstvo (Cotton Growing) 1960 : No. 1 : 39–44. [Russian].

Cotton branching is discussed in relation to earliness and other economic characters and it is shown that the breeding of *Gossypium hirsutum* varieties with a determinate compact branching habit and *G. barbadense* varieties with zero type of branching is a comparatively new development in the Soviet Union. Tabulated data are provided on the earliness, ginning percentage, boll weight, staple length, and fibre gauge, strength and breaking length, of varieties of the above two types recently developed at the Central Asiatic Station. The varieties with determinate branching are resistant to *Verticillium* wilt and outyield 108F or equal it in yield but have a higher ginning percentage. The varieties with a zero type of branching show improvements in yield, earliness, *Fusarium* resistance and technological properties in comparison with 5904I. Varieties of both types are suitable for combine harvesting.

5071 Rodrigues, L. C.
O melhoramento do linho. **(Flax breeding).**
Agricultura, Lisboa 1960 : No. 7 : 18–22.

Indications are given of the genes that control characters such as petal form, colour of petals, anthers and seeds, dehiscence of capsules, form of septa, resistance to various diseases, oil content and fibre yield. All these must, it is pointed out, be taken into consideration in breeding flax or linseed.

5072 Stoa, T. E.
Flax variety improvements and preferences on farms in N. Dak.
N. Dak. Fm. Res. 1961 : **21** : No. 10 : 19–25.

An historical account is provided of varieties released in North Dakota, with particular reference to improvements in resistance to *Fusarium lini*, *Melampsora lini* and *Mycosphaerella linorum*.

5073 Ivanova, R. & Matveev, N.
(High fibre content in the stems—an indispensable quality of a good fibre-flax cultivar).
Lën i Konoplja (Flax & Hemp) 1960 : No. 1 : 26–29. [Russian].

Mathematical evidence that fibre content of a variety is positively correlated with fibre yield per unit area and that fibre content is a constant heritable character is presented. It is noted that only hybrids with unstable inheritance show any significant variability in this respect. Flax breeders are urged to test breeding material at an early stage of selection by a reliable method known as "vegetation test". It is emphasized that this test has nothing in common with directed training.

5074 **Rust-resistant flaxes for the future.**
Agric. Res., Wash. 1961 : **9** : No. 9 : 10–11.

A reserve stock of 16 lines resistant to *Melampsora lini* has been developed in the USA, to protect flax against attack by new races. Each of the lines possesses resistance to one or more different races, a few of the lines being resistant to all known North American races. Breeding is continuing to produce lines each resistant to many races and together resistant to every known race. The 16 lines were developed by incorporating resistance from diverse sources into Bison, by back crossing. In field trials, the lines have compared favourably with control varieties in yield, height, date of maturity, seed weight per bushel and oil content. Like Bison, they have however the slight disadvantage of a lower iodine value (about 172) than is considered desirable. The lines possess a satisfactory degree of resistance to *Fusarium* wilt and some tolerance of pasmo. The complex of genes responsible for differential resistance was analysed by using the selective pathogenicity of native rust races, introduced races and new races produced in the laboratory by hybridization and X-ray induced mutations. Twenty-five genes have been found for host resistance and, correspondingly, 25 genes for virulence of the pathogen. Five loci for genes for host resistance have been identified, 11 of the 25 genes being alleles at one locus.

5075 Kerr, H. B.
The inheritance of resistance of *Linum usitatissimum* L. to the Australian *Melampsora lini* (Pers.) Lév. race complex.
Proc. Linn. Soc. NSW 1960 : **85** : 273–321.

"A physiologic race survey of the pathogen *Melampsora lini* (Pers.) Lév. was carried out at the Faculty of Agriculture, Sydney University, over the period 1948 to 1953. The races identified were used in studies of the mode of inheritance of resistance of the host varieties in the differential series. These studies confirmed the division of the Australian race complex into two major groups, Punjab-attacking and non-Punjab-attacking. The latter indicated the same pathogenic capacity as races previously identified by Flor from North and South American collections. With the exception of a resistance factor in Ottawa 770B, all the resistance factors operative against non-Punjab-attacking races had previously been identified by Flor in the respective differential varieties.

"Several differential varieties carried one or more additional resistance factors which were effective against the Punjab-attacking collections but which had not previously been detected in these varieties by Flor. This emphasized the relative avirulence (restricted host-range virulence) of this division of the Australian *M. lini* complex, and stressed the uniqueness of this group already indicated by the race survey in terms of host-range and geographic distribution (Kerr, 1959), and by studies of uredospore germination as evidenced by the unusual high temperature tolerance (Kerr, 1958).

"Three-way-cross material was used in most of these studies, and helped to establish the existence of only two allelic series in the linked *N* series previously identified by Flor in his differential varieties. There was no clear indication of allelic series of resistance factors other than those already located by Flor."
[Author's summary].

5076 MARTIN, A. L. D., FREDERIKSEN, R. A. & WESTDAL, P. H.
Aster yellows resistance in flax.
Canad. J. Pl. Sci. 1961 : **41** : 316–19.

Abyssinian (CI302) had a greater number of plants free from aster yellows than the other varieties tested at the Canada Department of Agriculture Research Station, Winnipeg. Selection of plants free from symptoms after exposure to caged leaf-hopper vectors (*Macrosteles fascifrons*) was carried out for five generations in Abyssinian and nine other varieties which had displayed some degree of resistance. In most tests, the strain selected from Abyssinian was more resistant to aster yellows than the selected strains of the other varieties and the unselected original varieties. This strain of Abyssinian, like the parental variety, is susceptible to rust, pasmo and wilt and is too short for growing in the Prairie region. It would however be satisfactory as an aster-yellows resistant parent in breeding.

5077 GURŽIJ, E. S.
(Breeding the new hemp varieties Gluhov 3 and Gluhov 1).
Nauč. Trud. Poltav. sel'skohozjajstv. Inst. (Sci. Res. Poltava agric. Inst.) 1959 : **6** : 164–71 : from Ref. Ž. (Ref. J.) 1961 : No. **4** : Abst. 4G608 : p. 59. [Russian].

The results of trials of the above varieties, which combine high seed and fibre yields, are reported. They were obtained by selection and environmental training of crosses between early varieties productive of seed with late ones having a high fibre yield.

5078 SUSTRINA, V. Ė.
(Vegetative hybridization of hemp as a method of producing initial breeding material).
Agrobiologija (Agrobiology) 1960 : No. **3** : 386–91. [Russian].

Tabulated information is provided on growth periods and stem and seed yields of vegetative hybrids and a few sexual hybrids of hemp bred at Penza. Most hybrids had high yields, especially of seed, and some approximated the standard variety Staro-Oskol'skaja Uluščennaja [Improved Staryj Oskol] in growth period. Hybrids of Caucasian/Togučin x Caucasian, Togučin/Caucasian x Caucasian and Togučin/Caucasian x Togučin were particularly productive. Hybrids with male plants as rootstocks had higher yields than those where female plants served as rootstocks.

5079 LUDNIKOVA, L. A.
(An experiment on production of tetraploid plants of uniformly ripening hemp).
Trud. 1. nauč. Konf. molod. Učen. Moldav. (Proc. 1st sci. Conf. jun. Sci. Moldavia) 1960 : 251–56 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G669 : p. 62. [Russian].

Colchicine-induced polyploids of early southern hemp and of a form with predominantly male flowers at Kišinev included some useful monecious types.

5080 BÓCSA, I.
Kísérleti adatok az uniszexuális F_1-hibridkender magtermőképességéről.
(Experimental data on the yielding capacity of the unisexual F_1 hybrid hemp).
Növénytermelés 1961 : **10** : 43–50.

From Tiborszallasi (♀) x Egylaki [Monecious] (♂) an F_1 hybrid with 93–97% monecious and female plants has been produced which surpasses the diecious mother variety by 70·5% in seed yield. The high yield is due to the high proportion of female plants in the hybrid, the yield per seed-producing hybrid plant being equal or inferior to that of the mother variety; the 1000-seed weight of the hybrid was also lower.

5081 SWAMINATHAN, M. S., IYER, R. D. & SULBHA, K.

Morphology, cytology and breeding behaviour of hybrids between *Corchorus olitorius* and *C. capsularis*.

Curr. Sci. 1961 : **30** : 67–68.

At the Indian Agricultural Research Institute, New Delhi, seedlings from a cross between *C. olitorius* 'Chinsurah Green' ♀ and (*C. capsularis* 'JRC13' grafted on to *C. olitorius* 'Chinsurah Green') ♂ included a single plant with weak unbranched stems and with leaves closely resembling those of the *C. capsularis* parent. The hybrid flowered earlier than the ♀ parent but later than the ♂ and produced a few, mostly solitary, flowers. The capsules were intermediate in shape and size between those of the parents and exhibited irregular projections and depressions along the ribs. Seed-coat colour was steel grey compared with green in *C. olitorius* and brown in *C. capsularis* and the seeds were intermediate in size.

In seven of the fifteen microsporocytes examined at metaphase I, one quadrivalent, or one trivalent and one univalent, were present; a mean configuration of $0·2_{IV} + 0·27_{III} + 5·47_{II} + 1·47_{I}$ is given. Pollen stainability was 60% and the mean number of seeds per capsule was 74·8 compared with 204·3 and 41·7 in *C. olitorius* and *C. capsularis* respectively. Segregation in the F_2 confirmed the hybrid nature of the plant. While detailed data will be reported elsewhere, it is mentioned that "the germination, survival and segregation behaviour of the F_2 population conforms to the pattern reported in interspecific crosses in genera where cryptic structural differentiation of chromosomes has played an important part in speciation."

A second hybrid was recently obtained from (*C. olitorius* 'IC325' grafted on to *C. capsularis* 'JRC212') ♀ x *C. capsularis* 'IC330' ♂; the pollen of the latter parent was subjected to 2000 r. of X rays. This hybrid resembled the first one morphologically and also had a single quadrivalent at microsporogenesis, indicating that both are heterozygous for a reciprocal translocation.

5082 VED PAL SINGH

Parthenocarpic development of fruit following an interspecific hybridization (*Crotalaria juncea* x *Crotalaria intermedia*).

Agra Univ. J. Res. 1961 : **10** : 131–34.

Parthenocarpic fruits were obtained from *C. intermedia* ♀ x *C. juncea* ♂, but all the ovaries dropped off after the reciprocal cross. The *C. juncea* pollen tubes in some cases reached the ovary. In the reciprocal, the pollen of *C. intermedia* germinated well but the tubes only traversed one-third of the length of the style. The failure of parthenocarpic development may not however be due to lack of stimulus caused by the arrested pollen-tube development but to differences between the two species as regards supply of growth substance and translocation of food material.

5083 JADHAV, A. S.

A new method of inducing polyploidy in Sann hemp (*Crotalaria juncea* L.).

Poona agric. Coll. Mag. 1961 : **51** : No. 3–4 : p. 40.

Polyploidy was induced in *C. juncea* by treating the tip of the primary root with 0·025–0·05% colchicine.

5084 VARGAS MÉNDEZ, J.

El kenaf (*Hibiscus cannabinus*). [**Kenaf (*H. cannabinus*)**].

Bol. Estac. exp. agríc. Tingo María 1960 : No. 16 : 1–14. (Mimeographed).

The results of varietal trials at the Tingo María Agricultural Experiment Station, Peru, are reported.

5085 FUKUSAWA, C. A., CAMPOS, F. F. & CAPINPIN, J. M.

Genetic aspects of the interspecific crosses between kenaf (*Hibiscus cannabinus* L.) and roselle (*Hibiscus sabdariffa* L.).

Philipp. Agric. 1960 : **44** : 223–35.

F_1 hybrids were obtained from *H. sabdariffa* ♀ x *H. cannabinus* ♂ but not from the reciprocal. They were taller and later in flowering than either parent, and sterile when selfed or back crossed. The hybrids were intermediate between the parents in stem, petal and leaf colour, frequency of bristles on the capsules, size of epicalyx and tensile strength of the fibre. In their prickly stems, short staminal column, compact stamens and palmately to deeply lobed leaves, they resembled *H. cannabinus*. In the remainder of the characters studied, the hybrids were similar to the ♀ parent.

5086 KUWADA, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. XVIII. The duration of the capacity for fertilization of the ovule and seed fertility).
Kagawa Daigaku Nogakubu Gakujutsu Hokoku/Tech. Bull. Fac. Agric. Kagawa Univ. 1959 : **11** : 19–22. [Japanese].

A comparative study of *Hibiscus esculentus*, *H. manihot* and their amphidiploid is reported. While the period of receptivity of the ovule in the parents is up to 10 hr. before and after anthesis, in the amphidiploid it is from 20 hr. before to 16 hr. after anthesis. Seed fertility is greatest at anthesis, declining less rapidly before and after this moment in the amphidiploid than in the parental species. [Cf. XXVII, 4207–8].

5087 KUWADA, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. XIX. Variation in physiological processes at various stages of growth).
Kagawa Daigaku Nogakubu Gakujutsu Hokoku/Tech. Bull. Fac. Agric. Kagawa Univ. 1959 : **11** : 23–27. [Japanese].

Using the same three types as in the previous paper [5086], the author determined the content of chlorophyll and dry matter, transpiration rate and cell-sap concentration for each at various stages in the developmental cycles.

5088 YOSHIOKA, S. *ET AL.*
(On the new ramie varieties Shiraginu and Aokaze).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1960 : **6** : 77–81. [Japanese].

Both the above varieties were selected from progenies of the variety Kagiseishu which had been allowed to hybridize spontaneously at the Kawaminami research station. Shiraginu [White Silk] (= Norin 1 [Ministry of Agriculture and Forestry 1]) is adapted to warm lowland areas; it produces tall, thick stems and is resistant to typhoon damage. Aokaze (= Norin 2) is also adapted to warm lowland areas; it is shorter but produces more and thinner stems than Shiraginu and is less resistant to typhoons.

5089 THOMBRE, M. V. & DESAI, M. C.
A preliminary note on autopolyploidy in *Agave cantala* L.
Sci. & Cult. 1960 : **26** : 276–77.

Treatment of seeds of *A. cantala* ($2n = ca. 90$) with 0·4% colchicine at the College of Agriculture, Poona, induced plants with $2n = ca. 180$, having thicker and broader leaves than the diploids. The effect of polyploidy on fibre quality is to be determined.

5090 PURI, Y. P.
Flowering habit, pollen characteristics, and seed germination of *Phormium tenax* Forster.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3351 : p. 739. (Abst.).

A report is given on investigations on flowering habit, artificial germination of the pollen, pollen storage, pollination and seed germination in Oregon. Pollen collected 6 hr. after the beginning of anther exsertion could be stored for 181 days at 0° C. and 35–40% relative humidity, giving 45% viability. The protandrous habit prevented self pollination, but selfed seeds could be obtained from isolated plants by hand pollination or by means of bees. Bees were important agents in natural pollination. At high temperature and low relative humidity, wind was also a pollinating agent.

5091 JAKOBAŠVILI, V. K.
(Luffa).
Priroda (Nature), Leningrad 1961 : No. 1 : 105–06. [Russian].

Three Indian varieties of *Luffa* introduced to Suhumi in 1959 are resistant to fungi and have long fruits making high-quality sponges.

5092 NISHIYAMA, I. & WATANABE, T.
[On intervarietal hybridization in *Edgeworthia papyrifera* (Shizuoka sort x Kochi sort)].*
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 228–32. [Japanese].

While the Shizuoka population is fairly fertile, the Kochi population is highly sterile. However, the latter crosses readily in either direction with the former. The modal meiotic configuration in the parents and hybrid is 18_{II} though an occasional quadrivalent is formed. [Cf. XXIX, 1791].

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* The English equivalent of this title, as given in the journal, is: Studies on artificial polyploid plants XXI. Morphological and cytological studies on F_1 hybrids of *Edgeworthia*.

SUGAR AND STARCH PLANTS

Annual Report of the Experiment Station of the South African Sugar Association for the year 1959–60 : Pp. 53.

5093 *Brett, P. G. C. Cane varieties.* (*pp. 30–33*).

N50/211 (POJ2725 x Co. 285) was distributed. Probably more resistant to mosaic and smut (*Ustilago scitaminea*) than any other commercial variety, it is the first sugar cane developed in Natal to undergo commercial release. The results of trials of seedlings of the N50, N52 and N54 series are summarized. The year 1959 was marked by the establishment of "environment stations" and the beginning of a new selection procedure [cf. 1442]. One-year-old seedlings were selected from single stools at the Experiment Station, Mount Edgecombe, and tested for Brix. Seedlings with sufficiently high Brix were planted in microplots on the environment stations. The parentages of the seedlings raised in 1959 are listed in an appendix. Further crosses were effected in the crossing season under review. Application of a day length of 12½ hr. induced flowering in marcotted shoots. Experiments on the artificial induction of pollen fertility included further study of the effect of temperature. A comparison was made between plots of unselected single-stool seedlings from five different crosses with plots of a standard variety (N : Co. 376). The seedlings were selected in the usual way; the plots were then harvested and weighed. The data revealed some correlation between the mean weights per plot and number of seedlings selected. The mean yield of a cross may thus possibly provide a fairly reliable indication of its value, even though variability is ignored. [Cf. 3608].

Annual Report of the Mauritius Sugar Industry Research Institute 1960 : Pp. 105 + XXXVIII.

5094 *George, E. F. & de Groot, W. Cane breeding.* (*pp. 35–45*).

The number of inflorescences available for crossing was seriously reduced by cyclone damage; crosses made in the field and in the greenhouse are briefly summarized. Although not generally successful, the hot-water method of emasculation was used with some success in the case of M147/44; female fertility was impaired however and only a small number of seedlings was obtained. Bunch-planted seedlings are being selected for yield. Details are given of a new selection procedure designed for the dual selection of seedlings in contrasting environments. While the 1960 yield trials were unreliable, information on cyclone resistance was obtained [5098].

5095 *Antoine, R. Cane diseases.* (*pp. 58–65*).
Observations on varieties undergoing heat treatment against ratoon stunting disease revealed varietal differences in germination percentage after treatment; Ébène 1/37 was the most severely affected and B37172 the least. Preliminary studies on varietal reaction to isolates of *Xanthomonas vasculorum* collected from Réunion Island, Mauritius, Madagascar and Natal indicate the existence of different strains of this pathogen. There is also some evidence of physiological differentiation within *X. albilineans.*

5096 *Williams, J. R. Cane pests.* (*pp. 66–70*).
The difficulties of assessing varietal resistance to stalk borer (*Proceras sacchariphagus*) in variety trials are discussed. A method of assessment now in use has given results in reasonable accord with field experience. Data obtained for the new varieties M202/46, M93/48 and M253/48 suggest that all are more susceptible than M147/44.

5097 *Rochecouste, E. Weed control* (*pp. 71–77*).
Differences in reaction to spraying with TCA and dalapon were found within both the triploid and the tetraploid biotypes of *Cynodon dactylon* [cf. 2316].

5098 *Rouillard, G. Cultivation, irrigation, climate. 2. Effect of cyclones on cane yield.* (*pp. 81–83*).

On the basis of percentage of broken canes and degree of recovery, M147/44 and B37172 were rated tolerant to cyclones.

5099 *Halais, P. Cultivation, irrigation, climate. 4. Highlights of final variety trials.* (*pp. 84–88*).

Notes are given on the performance of promising varieties under various environmental conditions.

Memoria de la XXXIII Conferencia Anual. Asociación de Técnicos Azucareros de Cuba. (**Report of the 33rd Annual Conference of the Association of Sugar Technologists of Cuba**). La Habana 1959 : Pp. 166.

5100 *Fors, A. L. Breve historia de la eugenesia de la caña de azúcar en Cuba.* (*A short history of the genetic improvement of sugar cane in Cuba*). (*pp. 15–20*).

Reference is made to the development and significance of some of the leading sugar-cane varieties in Cuba, notably ML3–18, C693–47 and Pepe Cuca.

5101 *Domínguez Llarena, G. Obtención de nuevas variedades y resumen de esa labor, en la Estación Experimental de la Caña de Azúcar en Jovellanos. (A summary of the work of obtaining new sugar-cane varieties at the Jovellanos Sugar-Cane Experimental Station). (pp. 21–25).*

Breeding and selection methods used at Jovellanos are briefly described. Promising seedlings obtained between 1946 and 1959, and their parent varieties, are listed.

5102 *Barreto Domínguez, R., Domínguez Llarena, G. & Valdivieso, A. S. (Jun.). Resultados obtenidos en los estudios comparativos de variedades realizados por la Estación Experimental de la Caña de Azúcar de Jovellanos en la zafra de 1959. (Results obtained in comparative varietal trials carried out by the Jovellanos Sugar-Cane Experimental Station on the 1959 crop). (pp. 33–34).*

In a 25-entry yield trial at Rosario, the outstanding varieties were C236–51, C693–47 and PR980 [cf. 693].

5103 Kandasami, P. A.

Studies in interspecific and inter-generic hybrids of *Saccharum*–II. Staminal sterility in certain F_1 hybrids with *S. spontaneum* as the pistil parent.

Indian J. Genet. 1961 : **21** : 75–76.

A pronounced tendency towards ♂ sterility was observed in crosses of *S. spontaneum* as ♀ with *S. officinarum* and with genera related to *Saccharum*. Crosses with *S. robustum* as ♂ were completely ♂ fertile, and combinations with *S. barberi* and sugar-cane varieties of hybrid origin as males showed little or no tendency towards ♂ sterility. When *S. spontaneum* was used as ♂, the hybrids were completely ♂ fertile. Intraspecific crosses within *S. spontaneum* were fertile. The expression of sterility varied according to the cross, being due to transformation of one, two or all three anthers into pistil-like structures or to non-dehiscence of normally developed anthers and the concomitant production of agglutinated pollen grains.

5104 Sorensen, H. G.

Resumé of sugar cane breeding work at Jaronú.

Sug. J. 1960 : **22** : p. 17.

Progress in cane breeding at the Jaronú Experimental Station, Cuba, since 1952–53 is briefly reviewed. *Saccharum spontaneum* 'Mandalay' and 'Burma' are being used to introduce cold resistance into noble canes. *Erianthus maximus* was used as pollen parent in a cross with NCo. 310; some of the resulting seedlings appear to be true hybrids. *E. maximus* has also been crossed as female with *S. spontaneum* 'Mandalay'.

5105 Subba Rao, K. S., Kandasami, P. A. & Natarajan, B. V.

Callus hair length and arrow colour in certain inter-generic hybrids of *Saccharum*.

Curr. Sci. 1961 : **30** : 188–89.

In intergeneric crosses involving *S. officinarum*, *S. robustum* and *S. spontaneum* as ♂ parents and *Narenga porphyrocoma* and *Sclerostachya fusca* as ♀ parents, callus hair length of the hybrids was intermediate between the respective parental values. All the hybrids exhibited the burnished-copper colour of the arrows that characterized the *Narenga* and *Sclerostachya* parents. Callus hair measurements of Hitam Rokan suggest that this variety may be a hybrid between *S. officinarum* and *Sclerostachya fusca*.

5106 **The sugar cane in the Deccan. Sixteenth Annual Convention of the Deccan Sugar Technologists' Association (India), 1959.**

Int. Sug. J. 1961 : **63** : No. 747 : 70–71.

Several papers on new varieties were presented at the above conference. Four new Co. lines, 678, 740, 775 and 789, have been released as varieties superior to the standard Co. 419. G. T. Babriwala reported that Co. 807, Co. 853 and Co. 948 were outstanding in both yield and sugar recovery in tests at Padegaon. In tests in the Malingar area, reported by P. M. Govitrikar and M. S. Khandsare, Co. 678, Co. 807 and Co. 948 gave good results.

5107 Nueva variedad de caña de altos rendimientos de azúcar. **(A new cane variety with high sugar yields).**

Bol. Asoc. Téc. azuc. Cuba 1961 : **20** : 28–29.

Information is provided on Puerto Rico 1013, a Co218 x POJ2878 cross developed at the Puerto Rico Agricultural Experiment Station. The new sugar cane is reported to be highly resistant to diseases. It has given excellent sugar yields in trials conducted in various parts of Puerto Rico.

5108 Vallance, L. G.

Four new varieties—Q.69, Q.71, Q.72, Q.73.

Cane Gr. quart. Bull. 1960 : **23** : 92–94.

Q69 is a sugar cane selected from Co.281 x

CP29/116. Germination, early vigour and ratooning are good and the variety arrows freely. Sugar content reaches a peak in mid-season and is maintained until late in the season. The variety is resistant to downy mildew (*Sclerospora sacchari*) but somewhat susceptible to mosaic; it is recommended for soils liable to drought.

Q71, which was bred from Co.270 x POJ2878, has a very high, early sugar content which is well maintained through the season; it is adapted to a wide range of conditions and soils in southern Queensland. The variety is highly resistant to mosaic but susceptible to ratoon stunting disease and Fiji disease; it is moderately susceptible to downy mildew.

Q72 is a drought-tolerant variety selected from Co.281 x POJ2878; it is somewhat susceptible to Fiji disease and downy mildew. It arrows sparsely and is recommended as a standover crop; it is said to be slightly superior to Vesta and POJ2878 for this purpose.

Q73 was selected from Trojan x Eros; it gives a good ratoon crop and has a high, early sugar content. It withstands flooding and wind damage and has a high degree of field resistance to bacterial mottle and gummosis; it is susceptible to ratoon stunting disease, chlorotic streak, downy mildew and yellow spot (*Cercospora kopkei*).

The first three varieties were developed at the Southern Sugar Experiment Station, Bundaberg, and the last-named at the Central Sugar Experiment Station, Mackay, Queensland, Australia.

5109 FREEMAN, K. C. & LYONS, E. S.

C.P.52–48, a new sugarcane for sirup production in southwest Georgia.

Ga. agric. Res. 1960 : **2** : No. 2 : 8–10.

On account of its stiff stalks and extensive root system, CP52–48 is less susceptible to lodging than CP29–116. Equal to CP29–116 in syrup quality, it has surpassed this variety in yield of cane and syrup per acre in the plant-cane and first and second-stubble crops in tests at Cairo, Ga.

5110 PRICE, S.

Cytological studies in *Saccharum* and allied genera. VI. Chromosome numbers in *S. officinarum* and other noble sugar canes.

Hawaii. Plant. Rec. 1960 : **56** : 183–94.

Chromosome numbers are given for 144 noble canes, together with details of parentage, where known, and comments on particular clones; a table of synonyms is also given. Despite the transmission by *S. officinarum* of the somatic number of chromosomes in certain interspecific crosses [cf. XXVIII, 766], the preponderance of 80-chromosome clones among those listed here suggests that the normal gametic number of chromosomes may be transmitted fairly regularly in intraspecific crosses. [Cf. XXX, 2948].

5111 CHIRANJIVI RAO, K. & GOPALA AIYAR, K. V.

On the starch content of some *Saccharum spontaneum* variants.

Curr. Sci. 1961 : **30** : p. 113.

The 14 varieties analysed at the Sugarcane Breeding Institute, Coimbatore, Madras State, varied widely in the starch content of stem and leaf samples. There appeared to be a geographical trend in this property since, in most cases, the nearer to the equator the place of collection of the varieties the lower the starch content.

5112 CROSS, W. E.

Studies on the sugar cane smut in Tucumán.

Int. Sug. J. 1960 : **62** : 239–42; 271–74.

A total of 59 varieties, classified as practically immune to *Ustilago scitaminea* in Tucumán, Argentina, are listed, together with 11 varieties classified as highly resistant. Factors influencing the intensity of attack on susceptible varieties are discussed. In a discussion of control methods, it is pointed out that resistance to the disease depends on the physical characteristics of the buds and not on the chemical composition of the canes.

5113 LONG, W. H., HENSLEY, S. D., STAFFORD, T. J., CONCIENNE, E. J. & McCORMICK, W. J.

New method for rating sugarcane varieties for susceptibility to the sugarcane borer in Louisiana.

Sug. Bull., N. Orleans 1961 : **39** : 175–78.

Ratings for susceptibility to borer (*Diatraea saccharalis*) were formerly based on percentages of nodes bored at harvest. Varieties have now been rated by the ratio of the cane yields per acre from endrin-treated and untreated plots, divided by the corresponding ratio for the CP44–101. Using this method, CP36–105 and N : Co. 310 were found to be the least susceptible among commercially-grown varieties, and the unreleased variety CP55–30 the least susceptible of all the varieties tested. The susceptibility rating for each variety will be recomputed annually.

5114 Comité de Collaboration Maurice-Réunion-Madagascar. Réunion du Sous-Comité de Phytopathologie du 9 février 1960. **(The Committee for Cooperation between Mauritius, Réunion and Madagascar. Meeting of the Phytopathological Subcommittee on 9 February 1960).**
Rev. agric. Réunion 1960 : **60** : 213–42.

A number of trials designed to test sugar-cane varieties for resistance to Fiji disease have been established in Madagascar.

5115 Coleman, O. H. & Dean, J. L. **The inheritance of resistance to rust in sorgo.**
Crop Sci. 1961 : **1** : 152–54.

Data on the reaction to *Puccinia purpurea*, under conditions of severe natural infection, of Planter (a rust-susceptible variety), MN960 (a resistant African introduction), and the progeny of crosses between these varieties, showed that resistance is controlled by a single dominant gene *Pu*. It was demonstrated that rust resistance was independent of plant colour (*Pp*), seed-coat type (*Ss*) and presence or absence of brown seed subcoat (*Bb*).

Prace Zakładu Buraka i innych Roślin Korzeniowych. **(Work of the Section of Beets and other Root Crops).**
Biul. Inst. Hodowl. Aklimatyz. Roślin 1957 : No. 20 : Pp. 120.

5116 *Szota, Z. Dziedziczenie barwnika u buraków cukrowych. (Inheritance of colour in sugar beets). (pp. 76–78).*

Seedlings of 19 sugar-beet varieties were examined 10–15 days from germination and divided into three groups according to the colour of their hypocotyls: homozygous pigmented, heterozygous pigmented and homozygous green. Considerable variation was observed in the degree of pigmentation of the homozygous group, and in their F_1 and F_2 progeny certain individuals with intense red pigmentation occurred, suggesting the operation of cumulative genes. The pigmented individuals had higher yields of roots, leaves and sugar in the cultivar AJ–1, though the differences were not statistically significant. Only 0·2% of the seedlings from the green plants were coloured. The progenies of the heterozygotes contained coloured seedlings in proportions varying from 2·90 : 1 to 4·10 : 1.

5117 *Filutowicz, A. Zastosowanie chowu wsobnego i heterozji w hodowli odmian buraka cukrowego kierunku cukrowego. (Application of inbreeding and heterosis in breeding high-sugar varieties of sugar beet). (pp. 79–81).*

Close breeding was applied to lines 368 and 372 of normal sugar beet by isolating 4–6 individuals and taking seed from one only, the progeny being separated into three groups of genotype *rr*, *RR* and *Rr* respectively for hypocotyl pigmentation. The two homozygous groups showed reduction in root yield in the I_2 generation, this being accompanied by an increase in sugar content. Neither of these two changes were observed in the heterozygous group. Marked increases in root yield, without much change in sugar content, were observed when *RR* plants of one line were crossed with *rr* plants of the other, the total yield of sugar per ha. being raised in this way from 32–33 c. to 53·53–55·21 c.; the corresponding yield from hybrids from *RR* x *rr* plants belonging to the same lines was 49·89 c.

Seed of the cross (368 *rr* x 372 *RR*) x (372 *rr* x 368 *RR*) was produced on a commercial scale, 6000 c. of seed being sown in comparative tests in randomized blocks at Puławy in 1956. The I_6 inbred lines were inferior to the cultivar AJ–3 and to tetraploid and monogerm cultviars in root yield; their sugar content was higher but their yield of sugar 10–12 c. per ha. less. The double-cross hybrid was equal to AJ–3 in root yield, somewhat higher in sugar content and about 6 c. per ha. higher in yield of sugar. The hybrid is to be registered under the name IHAR–C [Institute of Plant Breeding and Acclimatization C]. Still higher sugar yields were obtained however from some of the polyploid lines; thus Tetra–P gave 87·08 c. of sugar per ha. and the double-cross hybrid 77·93 c., where AJ–3 gave 71·33 c., I_6 368 *rr* 59·33 c. and I_6 372 *rr* 56·50 c.

5118 *Filutowicz, A. Badania nad męską i żeńską jałowością buraków cukrowych. (Studies on male and female sterility in sugar beets). (pp. 82–87).*

Female-sterile forms found in the X_2 generation after X irradiation and also in the inbred progeny of the line 372 RR with red hypocotyls are illustrated. They have remained completely female sterile over four generations; their pollen is normal and the F_2 generation segregates into 1 female sterile : 3 normal. The plants are normal in all respects but the form of the flower.

Relatively large numbers of male-sterile individuals have been found in certain varieties such as AJ–2 and CLR, most of them characterized by cytoplasmic sterility, and are being subjected to selection. A scheme is described for their use in breeding strains with the maximum heterosis and in producing triploids.

5119 *Jassem, B. & Jassem, M. Badania nad jednorodością i rozmiarami pyłku polskich odmian buraka cukrowego.* (*Studies on uniformity and dimensions of pollen of Polish varieties of sugar beet*). (*pp. 88–96*).

Pollen measurements were made on 19 varieties cultivated in Poland, the forms with pigmented hypocotyl (*RR*) being examined separately from those with green (*rr*). Tonnage and normal varieties in general had larger pollen grains, with a diameter greater than 21 μ, whereas in high-sugar varieties it was below; this corresponds to the smaller cell size in the high-sugar varieties. Variations in size were observed between different plants within the varieties; the variety AJ–1 for example had certain plants with coloured hypocotyls whose pollen grains were exceptionally large, with a mean between 27·31 and 27·50 μ, though their chromosome number was $2n = 18$ as in the rest. In 13 cases out of the 19 the pollen was larger in the plants with coloured hypocotyls.

5120 *Kużdowicz, A. Łatwe metody ustalania stopnia poliploidalności u roślin.* (*Easy methods of determining the degree of polyploidy in plants*). (*pp. 97–104*).

Various methods referred to in the literature are described. At the Institute for Plant Breeding and Acclimatization the method used to distinguish polyploid sugar beets from diploids is to count the pores in the pollen grains, which is done by staining them with nigrosine in solutions of 1 : 10 or 1 : 20; carmine or orcein can also be used. The number of pores in diploids is 5–10, with a mode at 7–8, and in tetraploids it is 10–20, with a mean of 14–16. These figures apply not only to early generations of polyploids but to C_8–C_{10} generations. It is thought that the same method could be applied to other root crops.

5121 ZANA, J.
Az 1959 évi összehasonlító fajtakísérletek és az 1951–59 évi kísérletsorozatok eredménye. (**Results of the 1959 comparative varietal trials and the 1951–59 trial series**).
Cukoripar, Budapest 1960 : **13** : No. 4 : 121–28; from Hungar. agric. Rev. 1961 : **10** : No. 1 : p. 11. (Abst.).

Information on sugar yield, root yield, sugar content, conductometric ash and *Cercospora* resistance is given for polyploid hybrids and diploids of sugar beet tested in Hungary.

5122 ZANA, J.
Összefoglaló kísérletek belföldi és külföldi cukorrépafajtákkal 1959-ben. (**Comparative trials of native and foreign sugar-beet varieties in 1959**).
Cukoripar, Budapest 1960 : **13** : No. 7 : 209–17; from Hungar. agric. Rev. 1961 : **10** : No. 1 : 11–12. (Abst.).

From trials of six Hungarian and 30 foreign varieties, data on sugar yield, root yield, *Cercospora* resistance, ash content and noxious nitrogen content are presented.

5123 CVETKOVIĆ, B.
Rezultati trogodišnjih sortnih ogleda sa šećernom repom. (**The results of three years' varietal trials with sugar beet**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 883–90.

The results of trials of 12 varieties are given in detail.

5124 ELLERTON, S.
The mechanization of spring work on the sugar beet crop.
Int. Sug. J. 1961 : **63** : 131–34.

The development and significance of polyploid and genetic monogerm sugar-beet lines are discussed, with particular reference to mechanization problems.

5125 IONESCU-ŞIŞEŞTI, V., JOVMIR, G., MUMJIEVA, E. & BĂDESCU, G.
Rezultatele experienţelor cu regimul de irigaţie, îngrăşăminte, spaţii de nutritie şi soiuri la sfecla de zahăr irigată pe solul brun-roşcat de pădure. (**Results of experiments on irrigation system, fertilizing, spacing and varieties in sugar beet under irrigation on reddish-brown forest soil**).
Lucrăr. şti. Inst. agron N. Bălcescu Bucureşti 1960 : 177–93.

These investigations included a varietal trial. The beet that did best under irrigation was Roman 1.2 (Buszczyński CLR x Buszczyński MLR).

5126 DESPREZ, M.
Évolution des méthodes de sélection de la betterave sucrière. (**Evolution of methods of sugar-beet breeding**).
Bull. tech. Ing. Serv. agric. 1961 : 135–42.

In this account of the introduction of new techniques into the sugar-beet breeding programme in France, reference is made to the significance of polyploidy, male sterility, genetically controlled monogerms and new methods for measuring disease resistance.

5127 Tiščenko, A. V.
(Crosses of varieties with lines as a method of raising productiveness in sugar beet).
Agrobiologija (Agrobiology) 1960 : No. 2 : 279–82. [Russian].

Plants with higher root or sugar yield than the mother variety or characterized by monogerm seed were selected from R 632, U 752, V 1612 and VP 206 at Poltava. The uniform mass-selected material, referred to as lines in the text, was then grown in alternate rows with the respective mother variety, to obtain heterotic hybrids. Tabulated information shows that all hybrids exceeded their mother variety in root and sugar yields. Heterosis observed in the F_1 hybrids of this kind showed a rapid decrease in the F_2 and F_3.

5128 Simon, M. & Roussel, N.
L'emploi des méthodes biométriques dans l'étude et l'expérimentation des variétés de betterave sucrière en Belgique. **(The use of biometric methods in studies and experiments on sugar beet varieties in Belgium).**
Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 305–17.

The value of improved field designs and techniques in the assessment of varieties at the Belgian Institute for the Improvement of Sugar Beet is discussed.

5129 Zosimovič, V. P.
(Pollen sterility and breeding for heterosis in sugar beet).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1960 : No. 5 : 40–49. [Russian].

Modern methods of sugar-beet breeding, involving the use of male-sterile lines for the development of heterotic hybrids, are reviewed. A number of recommendations are made for the introduction of certain of these techniques into the USSR breeding programme.

5130 Bornscheuer, E. & Schlösser, E.
Über Kreuzungen von *Beta vulgaris* mit Arten der Sektion *Patellares* der Gattung *Beta*. **(Crosses of *B. vulgaris* with species of the section *Patellares* of the genus *Beta*).**
Zucker, Hannover 1961 : **14** : 140–42.

Sugar beet was used as the mother plant in crosses with *B. procumbens* and *B. webbiana*. The F_1 seedlings were grafted on to sugar-beet plants and then treated with colchicine. Some F_2 seedlings were then obtained which showed inhibited root development but a few survived when grafted on to sugar beet. Two tetraploid F_2 hybrids resembled cultivated beet. From these results it is concluded that it will be possible to introduce valuable genes from the *Patellares* section into cultivated beets.

5131 Johnson, R. T. & Wheatley, G. W.
Studies on backcross generations and advanced generations of interspecific hybrids between *B. vulgaris* and *B. webbiana*.
J. Amer. Soc. Sug. Beet Tech. 1961 : **11** : 429–35.

The main purpose of these investigations at the Spreckels Sugar Company, Calif. was an attempt to transfer the resistance of *Beta webbiana* to *Heterodera schachtii* to *B. vulgaris*. Seed was produced on ♂ sterile sugar beets by supplying pollen from *B. webbiana*. Death of the F_1 plants was prevented by grafting. These plants failed to produce pollen and had an extremely high degree of ♀ sterility. BC_1 individuals produced by pollinating with sugar beet also required grafting and were pollen sterile, with a high degree of ♀ sterility. The five BC_2 plants secured grew on their roots. One plant produced viable pollen but the other four were ♂ sterile. After four back crosses to sugar beet, plants indistinguishable from sugar beet were obtained. Of the two BC_2 plants found to be nematode resistant, one was the ♂ fertile individual. In the BC_3, some plants also appeared to be resistant. In advanced generations derived from the BC_2 and in the BC_4, no resistance could however be detected in either greenhouse or field tests. Future investigations will be concentrated on determining the mode of inheritance of resistance and testing the reliability of the greenhouse method of evaluation.

5132 Bazavluk, V. Ju.
(The utilization of sugar-beet root buds differing in quality for increasing sugar content).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 131–41. [Russian].

By cutting off the top of the root the central axis was prevented from flowering and seed was collected from the peripheral shoots. In the variety Ja–010 the seed yield from plants so treated was invariably less than that from plants in which the central shoot was allowed to flower; in varieties R–632 and R–06 a slight increase in seed yield resulted from the treatment. The seedlings from peripheral and central inflorescences did not differ in vigour or in root weight but those from peripheral inflorescences had a higher sugar content, the difference amounting to 0·82% in the variety R–632, 0·43% in R–06 and 1·01% in Ja–010. Similar differences were observed in comparisons of progeny from the peripheral and central inflorescences of the same root.

5133 Kovaćević, V.
Prilog ispitivanju uticaja X i gama zrakova na seme šećerne repe. (**Studies on the effect of X and γ rays on sugar-beet seed**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 798–806.

Plants of Belje N, which had been exposed at the seed stage to X and γ irradiation at an intensity of 12,000 r., were attacked by *Cercospora* much later than control plants. X-ray-induced mutant forms included a rosette-type plant with several firm, intensely green, partially joined lanceolate leaves. This plant developed rapidly and produced a large number of inflorescences much earlier than usual. Leaves of a γ-ray-induced mutant were broad, oval and folded. Development was rather retarded in this plant. γ rays had little cytological effect. X rays caused some formation of chromosome bridges and univalents.

5134 Mazlumov, A. L.
Principalele realizări şi sarcini ale ameliorării sfeclei de zahăr. (**Principal achievements and aims in sugar-beet breeding**).
An. Romîno-Soviet. Ser. Agric.-Zooteh. 1960 : **14** : No. 2 : 70–79.

[Cf. XXX, 2970].

5135 Saharov, V. V., Platonova, R. N., Ščerbakov, V. K. & Mansurova, V. V.
(**Polyploidy in sugar-beet breeding**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 9 : 55–60. [Russian].

Methods of inducing polyploidy, the characteristic features of polyploids and the role of polyploidy in sugar-beet improvement are among the topics discussed in this review.

5136 Jevtić, S.
O stvaranju poliploidne šećerne repe. (**Breeding polyploid sugar beet**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 643–46.

Methods of breeding polyploid sugar beet as practised in Denmark, Italy, Sweden and West Germany are described.

5137 Fradkina, D. L.
(**The influence of cultivation and selection conditions on the productivity and bolting of sugar beet progeny, using larger spacing distances**).
Sahar. Svekla (Sug. Beet) 1960 : No. 2 : 13–17. [Russian].

Single-plant and mass selection for yield of roots, percentage sugar and resistance to bolting, within Janasz 1, M2E and other lines, were shown to be effective methods of improvement under conditions where row width and spacing distance were both 60 cm.

5138 Vodolazov, A.
(**New standard varieties of sugar beet**).
Sel'sk. Hozjajstv. Kirgiz. (Agric. Kirgiz.) 1959 : No. 5 : 33–36 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G687 : 63–64. [Russian].

Ramon' 023 and Frunze 786 have a considerably higher sugar content than the previous standard variety M2 in the Čujskaja valley of Kirgizia.

5139 Isák, H.
Möglichkeiten einer Erhöhung des triploiden Hybridanteiles polyploiden Zuckerrübensamens. (**Possibilities of increasing the proportion of triploids in polyploid sugar beet seed**).
Bodenkultur 1960 : **11** : 266–76.

Details are given of the different yields of triploids obtained by means of various systems of planting and harvesting the diploid and tetraploid parents.

5140 Hayashi, S. & Akita, K.
(**On sugar beet bolting in the warm region. II. On the bolting behaviour of autumn-sown sugar beet**).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1960 : **4** : 159–64. [Japanese].

A comparative study of six, mainly introduced, varieties, sown from October to December at Kakogawa, showed that Cesena NSA bolted least at each sowing date.

5141 Suezawa, K., Abe, H., Murai, O. & Yamamoto, T.
(On the relations between planting date and different varieties of sugar beet, on the one hand, and bolting, root weight and sugar content, on the other).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 284–87. [Japanese].

The bolting periods and flowering dates of an extensive series of varieties introduced from Europe and the USA and sown at various dates between 10 August and 20 October were determined under the climatic conditions in the prefecture of Kagawa. Data are also provided on the root weight and sugar content of some of the varieties most resistant to bolting.

5142 Vukov, K.
Die mechanischen Eigenschaften der Zuckerrübenwurzel. **(Mechanical properties of the sugar-beet root).**
Zucker, Hannover 1961 : **14** : 80–86.

Methods of determining properties which affect juice production by the diffusion process are described. Resistance to cutting is influenced by heredity and climatic factors; the values for 36 varieties are given. The diffusion constant of sucrose in the beet tissue is determined by hereditary factors, conditions during growth and ripening, and treatment of the harvested roots.

5143 Drachovská, M.
Über die Ergebnisse bei der Erforschung des technologischen Wertes der Zuckerrübe. **(On the results of investigations on the technological value of sugar beet).**
Zucker, Hannover 1961 : **14** : 182–87.

Current lines of research at the Sugar Industry Research Institute of Prague are indicated, with special reference to the determination of various technological properties and their relation to each other. The MW factor, i.e. the quantity of molasses produced per 100 kg. white sugar, is a rapid and useful measure of sugar yield, being low for the best varieties and high for the worst.

5144 Ulrich, A.
Variety climate interactions of sugar beet varieties in simulated climates.
J. Amer. Soc. Sug. Beet Tech. 1961 : **11** : 376–87.

Two "yield-type" varieties (curly-top resistant US22/3 and susceptible Kleinwanzleben E) and two "sugar-type" varieties (resistant US35/3 and susceptible Kleinwanzleben ZZ) were compared in four simulated climates in a phytotron, using pots containing vermiculite which was flushed daily with complete Hoagland's nutrient solution. The temperatures from 8·00 to 16·00 hr. and from 16.00 to 8.00 hr. were respectively maintained at 17° and 12° C. for "cold" climate, 20° and 14° C. for the "cool" climate, 26° and 20° C. for the "warm" climate and 30° and 22° C. for the "hot" climate. In the cold climate, US22/3 and US35/2 produced only one-half as much root and sugar yield as Kleinwanzleben E, whereas in the other three climates no significant differences were found between the three varieties. No variety-climate interaction for top growth or sucrose concentration was detected in these three varieties. For Kleinwanzleben ZZ, there were significant variety-climate interactions for sucrose concentration, top size and root yield. In comparison with the other varieties, ZZ also appeared to produce proportionately less sugar in the cold climate. Sugar production and root weight reached maximum mean values in the cool climate, the decline in sugar and root production in the hot climate being appreciable in all varieties. Variety-climate interactions were also noted for dry weight of leaves and leaf counts. Possible ways in which the curly-top resistant varieties lost the ability to form large roots in relatively cold weather, during the course of their development by selection, are discussed.

STIMULANTS

5145 Ranchez, P. F.
Selection in F_2 hybrids of Harom x Samsoun (Turkish tobacco).
Araneta J. Agric. 1960 : **7** : 281–310.

Harom [5156] has been crossed with Samsoun with a view to obtaining selections with a higher number of leaves and taller stature than Harom, larger leaves than Samsoun and improved aroma. Selections of both the Harom and Samsoun types showing various improvements were made in the F_2.

5146 Wittmer, G. & Scossiroli, R. E.
Stime della variabilità genetica di alcuni caratteri quantitativi in due cultivar di tabacco. **(Estimation of the genetic variability of some quantitative characters in two tobacco cultivars).**
Tabacco, Roma 1960 : **64** : No. 697 : 375–85.

Data similar to those in an earlier report

[XXX, 637] are presented for Virginia Bright line White Mammoth and for Burley Gran Reddito [High-yielding Burley], the mean family size being 3·1 in the former and 6 in the latter. Heritability values did not fall below 40% of the total phenotypic variation for the characters studied in Virginia Bright, whereas in Burley they were below 10%. Moreover, estimates of h^2 based on the pollen parent were, for all characters but leaf number, higher than those based on the seed parent in the case of Virginia Bright whereas they were lower in Burley. This low genetic variability is attributed to the fact that the Burley line in question had recently been subjected to inbreeding and selection.

5147 SCOSSIROLI, R. E. & WITTMER, G.
Confronto delle stime di ereditabilità (h²) per il numero di foglie nel tabacco ottenute da generazioni successive. **[Comparison of the estimates of heritability (h²) for leaf number in tobacco obtained from succeeding generations].**
Tabacco, Roma 1960 : **64** : No. 697 : 386–93.

The F_1 plants from the various parental combinations of Virginia Bright line White Mammoth referred to in a previous contribution [5146] were selfed and the F_2 families studied; three estimates of heritability were calculated: h^2_S based on the pollen parents, h^2_D based on the seed parents and h^2_P on selfing the seed parent. As in the F_1, h^2_D was again larger than h^2_S, the differences being even more pronounced than in the F_1; this difference is attributed to heterosis and effects of environment. The hereditary fraction of the variation, $h^2 = 0{\cdot}275$, agrees with that estimated in the F_1.

5148 DEMERDŽIEV, K., HRISTOV, J., ZLATANOV, G. & SĂRBANOV, V.
(Some physiological peculiarities of heterotic tobacco varieties).
Bălg. Tjutjun (Bulg. Tobacco) 1960 : **5** : 114–18 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 3 : Abst. 617 : 44–45. [Bulgarian]. (Mimeographed).

The seed of hybrids showed particularly high germination energy and germination capacity. Young hybrid plants were outstanding for their rapid growth and high content of dry matter and ripened 4–6 days earlier than varieties. The hybrids also had a lower transpiration coefficient.

5149 TOSKOV, N. & SPASOV, K.
(Heterotic combinations between the variety Virginia Bright and some oriental varieties).
Bălg. Tjutjun (Bulg. Tobacco) 1960 : **5** : 228–31 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 3 : Abst. 622 : 47–48. [Bulgarian]. (Mimeographed).

Hybrids between Virginia Bright on the one hand and Kosarsko 541, Červen cvjat [Red Flowered], Harmanlijska basma 163 and Nevrokop 5 on the other developed rapidly, having a growing period 20 days shorter than that of Virginia Bright. The hybrids retained the growth habit of this parent but were somewhat taller and gave higher yields, the smoking quality being much improved.

5150 MAGALONA, N. V.
A study of leaf angle of [White Vizbur (Vizcaya x Ky52) x Ky16)] F_1 and number of leaves of [Harom (Habana x Romero) x (Samsoun)] F_1.
Araneta J. Agric. 1960 : **7** : 225–48.

Data on the middle leaves suggested that F_1 White Vizbur x Ky16 had inherited the acute angle of insertion of the leaf characteristic of the ♂ parent. The leaf situated 9 in. from the base of the plant 63 days after transplanting was considered as the middle leaf. F_1 Harom x Samsoun was intermediate between the parents in leaf number and length of the middle leaves. Width of the middle leaves in this hybrid was greater than in either parent, but the differences were not significant. F_1 White Vizbur x Ky16 produced more leaves than either parent. In moisture percentage it was intermediate, White Vizbur having a higher content than Ky16.

5151 MEISELMAN, N., SPARROW, A. H. & GUNCKEL, J. E.
The radiosensitivity of two species of *Nicotiana* and of their interspecific hybrid.
Bull. Torrey bot. Cl. 1961 : **88** : 30–38.

N. bigelovii ($2n = 48$), *N. glauca* ($2n = 24$) and their F_1 hybrid ($2n = 36$) were exposed to γ radiation from Co^{60} at rates ranging from 37·5 to 375 r. per day, collections of shoot tips for cytological examination being made after 15, 21 and 39 days of exposure. Within the stocks, aberration frequency (bridges and fragments) in leaf cells with a particular dose rate showed no significant increase with increase in duration of exposure. Bridges and fragments occurred spontaneously with a 38% frequency in the hybrid controls, but none were found in the controls of the parent species. According to various criteria, *N. glauca* was the least and the hybrid was the most sensitive to radiation. Compared with those in the parent species, bridges in the hybrid may have differed in their mode of origin, as indicated by a disparity in fragment : bridge ratio and by configurations which suggested subchromatid exchange. Computations based upon the total percentage aberration at each dose rate for the three stocks were used to calculate regression lines. The slope of the regression line for *N. glauca* gave a value of 0·087 aberrations per 100 cells per r. The values for *N. bigelovii* and the hybrid were respectively 0·168 and 0·326. The unexpectedly high increase in sensitivity shown by the hybrid cannot be explained on the basis of relative chromosome number. It is therefore concluded that the increase is related to genetic instability or to a reduced growth rate. With slower growth, the duration of the complete nuclear cycle would be prolonged and thus each nucleus would be exposed to a greater cumulative dose before entering mitosis.

5152 SAND, S. A.
Effects of flower node position on the mutable *V* and stable *R* loci in a clone of Nicotiana.
Genetics 1961 : **46** : 569–74.

The results of this investigation have already been summarized [cf. 2366].

5153 WITTMER, G.
Mutabilità poligenica indotta da raggi X in *Nicotiana tabacum.* **(Polygenic mutability induced by X rays in *N. tabacum*).**
Tabacco, Roma 1960 : **64** : No. 697 : 394–403.

Further studies were made on Virginia Bright line T19 [cf. XXX, 2981] in the second generation from the irradiated plants. The variance for width of corolla tube within lines proved to be equal in the progenies from plants irradiated at the two doses 18096 x 10^4 r. and 9048 x 10^3 r. and in the controls. The variance between lines was significantly greater than in the controls in the progeny from the higher but not in that from the lower dose. For height of corolla the differences were not so marked. Covariance between the two characters was not significant in the controls and lower dose but for the higher dose a high value of $r = 0{\cdot}474$ was obtained. It is concluded that the increased variance has resulted from mutation induced by the irradiation.

5154 PERFANOV, G. & GĂLĂBOV, S.
(New varieties of Džebel-basma).
Bălg. Tjutjun (Bulg. Tobacco) 1960 : **5** : 24–27 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 2 : Abst. 377 : 99–100. [Bulgarian]. (Mimeographed).

The morphological, biological and industrial characters of Džebel 190 and 174 are described [cf. XXI, 3699].

5155 ACIERTO, B. C.
A study on the variability of F$_8$ hybrid Golden Simox Virginia tobacco.
Araneta J. Agric. 1960 : **7** : 249–62.

Studied at Araneta University, Philippines, an F$_8$ strain (2BW–3–51–1) of Golden Simox [Golden Harvest x F$_1$ (Simmaba C x Oxford 26)] displayed only slight variability in agronomic characters and seed production, this variability being mostly attributable to environmental conditions.

5156 AGARPO, M. S. N.
A study on the variability of F$_8$ hybrid Harom.
Araneta J. Agric. 1960 : **7** : 263–80.

Tested at Araneta University, Philippines, the F$_8$ of the Turkish type Harom (Havana x the Philippine small-leaved aromatic tobacco Romero) showed only small variations in agronomic characters and seed production, this variability being largely due to environmental conditions.

5157 **New tobacco available.**
Sci. Fmr., Pa. 1961 : **8** : No. 4 : p. 6.

Two cigar-filler varieties, Pennbel 69 and Pennleaf 1, both resistant to wild fire and moderately resistant to root rot, have been jointly released for trial by the Pennsylvania Agricultural Experiment Station and US Department of Agriculture. Pennbel 69 is also resistant to mosaic. Both have outyielded commonly grown varieties.

5158 **Root knot doesn't affect NC 95.**
Agric. Res., Wash. 1961 : **9** : No. 8 : p. 15.

Developed by the US Department of Agriculture and North Carolina Agricultural Experiment Station, NC95 is the first flue-cured tobacco resistant to root-knot nematode to be released. In infested soils, it has shown no galling or other evidence of root knot. Even in the absence of the pest, NC95 has yielded about 10% more than Hicks Broadleaf and equalled the high-yielding, black-shank resistant varieties NC75 [XXX, 4178; XXXI, 735] and Coker 316. When grown under similar conditions, it is equal in flavour to NC75 and Coker 316, and nearly equal to Hicks Broadleaf.

In chemical composition, the leaves are similar to those of Hicks Broadleaf. Nicotine content is higher than in Coker 316.

5159 GERSTEL, D. U.
The origin of tobacco; new problems.
Bull. Res. Counc. Israel 1961 : **9D** : 197–98. (Abst.).

The enzymatic process responsible for the conversion of nicotine into nornicotine in wild species of *Nicotiana* is known to be under the control of a single dominant gene in each species. Most probably the allopolyploid ancestor of tobacco first existed as a wild plant. This ancestor must have carried two converter genes, one from each parent, and its mature leaves would not have been fit to chew or smoke. It may have therefore been utilized before the converter enzyme could act, that is, in the green state, or the green leaves may have been exposed to sufficient heat to destroy the enzyme or to dehydrate the leaves to prevent enzyme activity. Unfortunately, only scant anthropological evidence is available on early methods of harvest and postharvest treatment. A further problem is how loss of two independent converter genes could have been recognized and how lines first with one converter and then without such a gene could have been selected for agronomic use.

5160 MURAOKA, Y.
(**Studies on the germination of tobacco seed. I. Characters involved in the physiology of germination in the principal cultivated varieties of Japan and their classification**).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1952 : No. 36 : 1–22. [Japanese].

The effects of constant and alternating temperatures and of light or darkness on the percentage germination and germination rate of 37 varieties were investigated. The optimum temperature for germination was an alternation between 18 hr. at 20° C. and 6 hr. at 30° C. Marked varietal differences were noted, however, in the degree of retardation of germination caused by constant high temperature. All varieties germinated best in the light but the ability to germinate in the dark was a varietal characteristic correlated with tolerance of constant high temperature.

5161 BURCEV, JU. A.
(**Breeding *Nicotiana rustica* varieties producing fewer suckers**).
Agrobiologija (Agrobiology) 1960 : No. 3 : 345–49. [Russian].

An account is given of breeding varieties which develop few or no secondary suckers together with a description of Malopasynkovaja 2 [Few-suckered 2], bred for this character at Simferopol'. The method consisted of crossing malformed hybrids of the type known as Omega, in this instance a hybrid of Indusskaja 15 [Indian 15] x Hmelovka, with an Omega plant of the variety Pozdniki. The development of secondary suckers in Malopasynkovaja 2 has been greatly reduced by continuous selection. In Ukrainian trials the new variety was more productive, leafy and resistant to diseases and scorching than Hmelovka and produced high-grade leaves with an improved nicotine content. The variety has been introduced on Ukrainian farms and was made a standard in Poltava province in 1960. In addition it is being used for breeding other varieties with the desired character. At Simferopol' it was crossed with Vysokoroslaja Zelenaja 317 [Tall Green 317] and F_6 hybrids with hardly any suckers are now available. Several promising hybrids of Malopasynkovaja 2 with local Ukrainian varieties are reported from Lohvica.

5162 KURODA, M.
(**On the genetics of the mammoth character in tobacco**).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1952 : No. 36 : 23–41. [Japanese].

The genetics of the mammoth character was studied in the F_0–F_2 of crosses involving normal tobacco and mammoth varieties in the ca. 45-leaf and ca. 90-leaf categories. The normal type was imperfectly dominant over the mammoth types and the ca. 45-leaf mammoth type was imperfectly dominant over the ca. 90-leaf type.

Symposium on the objective evaluation of the natural or controlled evolution of tobacco from harvesting to utilization : physical, chemical and biological methods, characteristic indices, correlation with quality.
Coresta, Paris 1961 : No. 1 : Pp. 179.

5163 *Bolsunov, L. & Kuhn, H. Recherches ultérieures sur l'influence des procédés de dessiccation sur la formation de la nornicotine dans les feuilles de tabac.* (*Further investigations on the influence of curing methods on the formation of nornicotine in tobacco leaves*). (*pp. 65–71*).

It is mentioned that varieties with 3·5 to 6% nornicotine have been bred at the Tobacco Improvement Station, Fürstenfeld, Austria.

5164 Takahashi, T. & Kono, K.
(On differences between tobacco varieties in response to magnesium deficiency).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1957 : No. 42 : 73–75. [Japanese].

A comparative study of five American varieties is reported. Dixie Bright 101 was the most tolerant of magnesium deficiency.

5165 Nomura, Y., Kurihara, T. & Tezuka, T.
(Studies on red leaf. I. Selection of strains in which red leaf does not occur).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1956 : No. 39 : 1–5. [Japanese].

Japanese populations of the variety Bright Yellow have been found to vary in their incidence of the above defect. It should be possible to eliminate it by selection.

5166 Oka, H. & Ohashi, Y.
(Intervarietal differences in resistance to *Pseudomonas solanacearum*).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1959 : No. 44 : 1–16. [Japanese].

The resistance of strains from crosses between Bright Yellow and Japanese air-cured tobacco varieties and of a series of flue-cured varieties imported from the USA was tested under conditions of heavy natural infection. The most resistant form was a selection from the cross Bright Yellow x Odaruma 22 [Large Dharma 22].

5167 Oka, H. & Ohashi, Y.
(Investigations on breeding for resistance to *Pseudomonas solanacearum*).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1959 : No. 44 : 17–38. [Japanese].

Oxford 26 tobacco (resistant to *Ps. solanacearum*) was crossed with Bright Yellow (susceptible). Two F_6 selections, 8111 and 8342, were resistant and had the desired narrow leaves but cured unsatisfactorily. These lines were therefore crossed with Dixie Bright 101 and Dixie Bright 244, and two F_2 selections, one from 8111 x Dixie Bright 101 and the other from 8111 x Dixie Bright 244, had satisfactory leaf shape and curing properties, though resistance to *Ps. solanacearum* had meanwhile weakened.

5168 Smiley, J. H. & Stokes, G. W.
Resistance to the wildfire disease in relation to the gene-chromosome set ratio in tobacco.
Phytopathology 1961 : **51** : 174–75.

Numerical determinations were made of the populations of *Pseudomonas tabaci* recovered from inoculated leaves of 2*x*, 3*x* and 4*x* plants respectively possessing the following different numbers of genes for resistance to this pathogen: 0, 1, 2; 0, 1, 2, 3; and 0, 2, 4. Within the 2*x*, 3*x* and 4*x* groups, an inverse relationship was detected between number of genes and bacterial population. The bacterial populations proved to be the greatest in plants with no genes for resistance and least in those having gene number/chromosome number relationships of 2/2*x*, 3/3*x* and 4/4*x*. The populations were intermediate in plants representing the relationships 1/2*x* and 2/4*x*. A direct correlation was found between number of bacteria and symptoms of the disease.

5169 Izard, C. & Schiltz, P.
Observations sur la germination des graines de quelques *Nicotianae* résistantes au mildew du tabac (*Peronospora tabacina* Adam). [**Observations on the germination of the seeds of some *Nicotianae* resistant to tobacco mildew (*P. tabacina* Adam)**].
CR Acad. Sci., Paris 1961 : **252** : 3113–15.

N. debneyi, *N. megalosiphon*, *N. goodspeedii*, *N. knightiana* and Hicks Resistant (*N. tabacum* x *N. debneyi*) tend to produce dormant seeds. Studies at the Tobacco Experimental Institute, Bergerac, showed that seeds of these *P. tabacina*-resistant lines practically lose this characteristic when exposed to continuous light for a number of days or when treated with gibberellic acid or uranium nitrate.

5170 Ivančeva-Gabrovska, T.
[**The resistance of some tobacco varieties to black shank (*Ph. parasitica* var. *nicotianae*)**].
Rast. Zaštit. (Pl. Protect.) 1960 : **8** : 25–31 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 3 : Abst. 642 : p. 59. [Bulgarian]. (Mimeographed).

Of the many varieties tested at Rila in Bulgaria, Dixie Bright 101 appeared to be immune from this pathogen and Huang Mian Yu 79 and Oxford 3 were highly resistant; these three tobaccos are thought to be particularly useful as parents in breeding for resistance; other varieties also showed good resistance.

5171 Ohashi, Y. & Murai, T.
(Studies on resistance to *Phytophthora parasitica* var. *nicotianae*. I. On intervarietal differences in resistance).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1959 : No. **44** : 91–100. [Japanese].

A series of 71 Japanese and introduced tobacco varieties and 6 species of *Nicotiana* were subjected to artificial inoculation. The most resistant were the following: Coker 187, Dixie Bright 101, Florida 301, *N. longiflora* and *N. plumbaginifolia*. All the Japanese varieties were highly susceptible.

5172 Dukes, P. D. & Apple, J. L.
Influence of host passage on virulence of *Phytophthora parasitica* var. *nicotianae*.
Plant Dis. Reptr. 1961 : **45** : 362–65.

Two isolates of *Ph. parasitica* var. *nicotianae* derived from single zoospores were passed serially through plants of the tobaccos Bottom Special (susceptible) and Coker 139 (resistant). Each successive series of plants was inoculated with diseased tissue from the preceding series without reisolation of the pathogen. Reisolates were however obtained from the fourth and eighth (final) series, in order to compare the isolates for pathogenicity, using Bottom Special and Coker 139. The index of pathogenicity of both isolates increased significantly as the result of eight serial passages through plants of the susceptible and resistant varieties. Only one isolate had increased in virulence after the fourth passage through Bottom Special, while neither isolate showed a significant increase in virulence after the fourth passage through Coker 139. The authors suggest that, under field conditions, more highly virulent biotypes may arise as a result of continuous tobacco cultivation in infested soil, with either susceptible or resistant varieties.

5173 Ohashi, Y. & Murai, T.
(Studies on resistance to *Thielaviopsis basicola*. I. On intervarietal differences in resistance).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1959 : No. **44** : 65–74. [Japanese].

Tests of 75 introduced and Japanese tobacco varieties, *Nicotiana debneyi* and *N. plumbaginifolia* in infected soil in a greenhouse are reported. The most resistant forms were Virginia Gold and Riwaka 5, among the yellow types, many Burley varieties, Aspasia, FO, Geddertheimer Strassburg, Ghimpaţi, Ialomiţă, NFT51, T189 and the two species.

5174 Ohashi, Y. & Murai, T.
(Studies on resistance to *Thielaviopsis basicola*. III. On variation in the pathogen).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1959 : No. **44** : 83–90. [Japanese].

Twelve isolates from the prefecture of Aichi are classified into three groups according to their degree of pathogenicity on moderately resistant varieties.

5175 Oka, H., Yoshino, K. & Nakatogawa, H.
(Intervarietal differences in resistance of tobacco to cucumber mosaic).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1959 : No. **44** : 111–18. [Japanese].

A series of Japanese and introduced varieties were tested for degree of resistance by counting the lesions induced by a mosaic strain causing local necroses. The most resistant varieties were TI245, strain 12, Turkish Samsun, Hicks Broadleaf and TI259.

5176 Holmes, F. O.
Inheritance in tobacco of an improved resistance to infection by tobacco mosaic virus.
Virology 1960 : **12** : 59–67.

"Lines of tobacco, *Nicotiana tabacum* L., less susceptible to infection by tobacco mosaic virus than any previously available, were produced by combining a number of major and minor genes for resistance. Two genes by which T.I. 245 tobacco was found to differ from the more susceptible Turkish tobacco were combined with the gene *N* (for necrotic-type response to infection), G_1 or G_2, or both of these (for non-haloed lesions), and r_{m1} and r_{m2} (for reduction in size of lesions). The new lines produced fewer, smaller, and later-developing necrotic local lesions in inoculated leaves than did earlier lines." [Author's summary].

5177 Endo, H., Wada, A., Miura, K., Hidaka, Z. & Hiruki, C.
Mutation in tobacco mosaic virus induced by a new carcinogen, 4-nitroquinoline N-oxide.
Nature, Lond. 1961 : **190** : 833–34.

Recent experiments in Japan have shown that within a wide range of concentrations 4-nitroquinoline N-oxide (4-NQO) (1) does not inactivate tobacco mosaic (TMV) although it inactivates extracts of TMV RNA in proportion to its concentration, and (2) induces mutation in both TMV and TMV RNA, but at a much higher rate in the latter than in the former. The mutagenic action of 4-NQO was estimated by the number of necrotic lesions produced in the leaves of *Nicotiana tabacum* 'Xanthe'; it is well established that the necrotic lesion is specifically produced by a mutant of TMV. Control experiments in which 4-NQO solution alone was applied to tobacco leaves proved that no necrotic reaction was caused by this substance. Reasons are given for ruling out the possibility that deamination by nitrous acid produced as the result of substitution of the carbon at position 4 of the 4-NQO molecule by nucleophilic reagents was responsible for the mutation of RNA induced by 4-NQO. That 4-NQO induced mutation without involving change in the infectivity of TMA suggests the possibility of considering inactivation and mutation separately, and leads to the view that the mutagenic action of 4-NQO may be basically different from that of nitrous acid, treatment with which brings about inactivation and mutation simultaneously.

5178 HIDAKA, Z. & TOMARU, K.
(Strains of cucumber mosaic virus from tobacco. I. Ordinary strain. II. Mild strain. III. Yellow-spot strain).
Hatano Tobako Shikenjo Hokoku/Bull. Hatano Tobacco Exp. Sta. 1960 : No. 46 : 125–49. [Japanese].

Detailed virological descriptions are given of the above three strains, including their effects on 9 tobacco varieties and on numerous *Nicotiana* spp.

Annual Report of the Tocklai Experimental Station of the Indian Tea Association 1959 : Pp. 396.

5179 *Botanical Branch. Research and experiment.* (*pp. 58–63*).

The following are among the investigations referred to. Contrary to the customary belief, the stems of the shoots have been found to make a greater contribution to quality than the leaves. The significance of this finding in relation to breeding policy and other aspects of tea production is emphasized. Mass selection for pubescence and vigour has given encouraging results as a means of producing high-quality seed under estate conditions.

5180 *Wight, W. & Gilchrist, R. C. J. H. Concerning the quality and morphology of tea.* (*pp. 69–86*).

Referring mainly to published work and dealing only with populations cultivated in the plains of north-east India, the authors define quality and discuss its relationship with pubescence and the phloem index (frequency of cells containing crystals of calcium oxalate in the phloem of the petiole).

5181 HARADA, S., NAKAYAMA, A., KANO, T. & SAKAI, S.
(Studies on the resistance of tea to cold. V. The winter hardiness of Indian, Indian hybrid and Chinese sorts).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1960 : **29** : 149–50. [Japanese].

Laboratory freezing tests showed that Indian-Chinese hybrids were much more readily damaged by low temperature than Chinese varieties though not so severely as Indian tea. Cell size of the leaves was negatively correlated with hardiness. [Cf. 2393].

5182 **Twelfth Annual Report of the Research Department of the Coffee Board, Coffee Research Station, S. India, 1958–1959** : Bull. No. 12 : Pp. 183.

Hybridization of *Coffea arabica* continued, with the purpose of developing high-yielding, vigorous cultivars resistant to leaf disease (*Hemileia vastatrix*). Field observations on advanced selections of intraspecific hybrids are reported. Seedling and clonal progenies of selections belonging to the BA series maintained their freedom from leaf disease. Evaluation of seedlings from back crosses of *C. robusta* x *C. arabica* 'Kents' with each parental species continued; a few second back crosses were effected. Some crosses involving Devamachy hybrids yielded progenies which have so far remained free from leaf disease in the field. A haploid of Kents was studied meiotically [XXX, 4182]. Further morphological and embryological studies were carried out in relation to triage production in varieties and selections of *C. arabica*. Trials of seedling and clonal progenies of *C. robusta* selections (BR series) continued. Two colchicine-induced tetraploids of this species flowered profusely but produced only a few defective berries. Hybrids of (1) *C. excelsa* x *C. eugenoides* and (2) *C. robusta* x *C. eugenoides* were studied.

Observations on the incidence of leaf disease on a large number of species, varieties and selections from outside India are summarized.

5183 CARVALHO, A.
Melhoramento de café Robusta. (**Improvement of Robusta coffee**).
Bol. Suptda. Serv. Café, S. Paulo 1960 : **35** : 9–10.

Reference is made to some of the differences between *Coffea arabica* and *C. robusta* and to *C. robusta* breeding programmes in Indonesia and in various African states.

5184 FERNIE, L. M.
The selection of Arabica coffee at Lyamungu: I. The "N" series.
Res. Rep. Coffee Res. Sta., Lyamungu 1960 (1961) : 12–17.

The N series of selections originated from trees believed to be of the Bourbon type, growing at Kilema on the southeastern slopes of Mt. Kilimanjaro at about 4300 ft. above sea level. The selections finally isolated are bronze tipped, but until a more definite identification has been made, all members of the series will continue to be regarded as Bourbon. At the lower altitudes, the final selections are capable of yielding well, and a few have also produced beans with consistently high liquoring quality. N39, in particular, is noteworthy for its combination of high quality and high yield. During 1950–59, seed of 14 N selections has been distributed from Lyamungu to growers in Tanganyika. All N selections are susceptible to races I and II of leaf rust (*Hemileia vastatrix*), endemic in E. Africa. Use of N39 in a small-scale programme of breeding has resulted in some heterotic hybrids, e.g. N39 x VC496 (Geisha), with a high degree of leaf-rust resistance, as well as good yielding capacity during the first three years of bearing.

5185 SYBENGA, J.
Genética y citología del café. Una revisión de literatura. (**The genetics and cytology of coffee. A review of literature**).
Turrialba 1960 : **10** : 83–137.

SYBENGA, J.
Genetics and cytology of coffee.
Bibliogr. genet. 1961 : **19** : 217–316.

This comprehensive review includes sections dealing with taxonomy, distribution, floral biology, interspecific hybridization, chromosomic and cytoplasmic inheritance, chromosome number, morphology and behaviour, haploidy and polyploidy, induced mutations, and genetic and cytological techniques.

5186 NARASIMHASWAMY, R. L. & VISHVESHWARA, S.
Report on hybrids between some diploid species of *Coffea* L.
Indian Coff. 1961 : **25** : 104–09.

Observations on the F_1s of (1) *C. canephora* x *C. liberica*, (2) *C. canephora* x *C. eugenioides*, (3) *C. excelsa* x *C. eugenioides* and (4) *C. liberica* x *C. eugenoides* are reported from the Coffee Research Station, Chikmagalur District, Mysore State. In each combination, some plants bear a close resemblance to the ♀ parent, while the remainder have characters generally intermediate between the two parents. Plants in the first category are not however identical with the maternal parent; their progenies are being raised for further analysis. A high proportion of the plants from (1), (3) and (4) have distinctly poor growth. One out of the 6 plants from (4) and 10 out of the 50 from (3) are dwarfs. Pollen sterility has been high and fruit set nil or sparse. The genomes of the parental diploids thus appear to have only a low amount of homology.

5187 VAYSSIÈRE, P.
L'Éthiopie, pays d'origine du caféier d'Arabie. (**Ethiopia, country of origin of Arabica coffee**).
Café, Cacao, Thé 1961 : **5** : 77–81.

On the basis of a study of *Coffea arabica* populations in Ethiopia, the author suggests that the species may have originated in that country. Genetic evidence (wide diversity of forms and the existence of primitive characteristics), as well as historical and agricultural evidence, supporting this proposal is presented.

5188 DUBLIN, P.
Quelques données sur la productivité du caféier excelsa en République Centrafricaine. (**Some data on the productivity of excelsa coffee in the Central African Republic**).
Café, Cacao, Thé 1961 : **5** : 11–27.

Yield data from various sources are summarized and some observations are made on the factors affecting the regularity of bearing in *Coffea excelsa*. Attempts to correlate high productivity with various morphological characters were not successful.

5189 MEIFFREN, M.
Contribution aux recherches sur la trachéomycose du caféier en Côte d'Ivoire. (**A contribution to researches on tracheomycosis of coffee trees in the Ivory Coast**).
Café, Cacao, Thé 1961 : **5** : 28–34.

The results of inoculating a range of local and imported material with *Fusarium* (*Gibberella*) *xylarioides* are presented. Some evidence was found that resistance to this disease may be related to the amount of chlorogenic acid in the wood of the stem.

5190 Burdekin, D. A.
Survey of races of coffee leaf rust in northern Tanganyika.
Res. Rep. Coffee Res. Sta., Lyamungu 1960 (1961) : 60–61.

The survey suggested that races I and II of *Hemileia vastatrix* are widespread in the Northern, Tanga and Eastern Provinces. If the occurrence of race III at Lyamungu is confirmed, this will be the first record of the race in East Africa.

Proceedings of the VIII Inter-American Cacao Conference, Trinidad and Tobago, 15–25 June, 1960 :
Pp. 513. (Mimeographed).

5191 *Bartley, B. G. D. Seminar on cacao breeding and selection, 13–14 June, 1960.* (*pp. 25–35*).

A report is given on the seminar held at the Imperial College of Tropical Agriculture, Trinidad, in conjunction with the eighth Inter-American Cacao Conference. The topics reviewed and discussed among the 27 participants from various countries were: (1) cacao populations and single plant selection; (2) sexual methods of breeding, breeding systems and utilization of heterosis; (3) quantitative inheritance; (4) field experiments; (5) seed production and plant distribution methods; (6) disease resistance; (7) genetic studies, incompatibility systems and pollinations; and (8) breeding for flavour and quality.

5192 *Ampuero, E. & Desrosiers, R. Comportamiento en resistencia a la escoba de bruja de los clones Silecia–1 y 5 traidos del Oriente Ecuatoriano.* (*Resistance to witches' broom shown by the clones Silecia 1 and 5 brought from eastern Ecuador*). (*pp. 156–65*).

Two Silecia clones, selected in the Río Napo area in 1949, showed greater resistance to *Marasmius perniciosus* in 1956–59 trials than did clones SCA6, SCA12 and ICS1. Progeny derived from crosses between the Silecia clones (used as ♂ parents) and other lines also showed high resistance.

5193 *Ampuero, E. Progresos alcanzados en el Ecuador en el estudio de selección para resistencia a la escoba de bruja.* (*Progress made in Ecuador in the selection programme for resistance to witches' broom*). (*pp. 166–73*).

As a result of investigations conducted in Ecuador since 1949, a number of pure clones and interclonal hybrids showing high resistance to *Marasmius perniciosus* combined with favourable pod and bean characteristics have been selected. These selections are now being tested under various environmental conditions.

5194 *Ampuero, E. & Alvarado, R. Variación en resistencia a la escoba de bruja, rendimiento e índice de mazorca en la progenie híbrida interclonal.* (*Variation in resistance to witches' broom, yield and pod index in interclonal hybrid progeny*). (*pp. 174–83*).

Observations on the progeny resulting from 62 interclonal crosses effected at the Tropical Experimental Station, Pichilingue, Ecuador, are reported. Crosses in which SCA9 was involved were most susceptible to *Marasmius perniciosus* but gave the highest yields. Certain crosses between local Ecuadorian clones were highly resistant to the disease but gave very poor yields. The hybrids selected as the most promising were SCA6 x EET62, SCA12 x EET6, SCA12 x EET48, SCA12 x EET238, SCA6 x ICS1 and SCA6 x EET156.

5195 *Delgado, J. C., Ampuero P., E. & Doak, K. D. Posible evidencia de resistencia a la* Monilia roreri *Cif. y Par. en algunos clones de la Estación Experimental Tropical de Pichilingue.* (*Possible evidence of resistance to* M. roreri *Cif. & Par. in certain clones of the Tropical Experimental Station of Pichilingue*). (*pp. 184–92*).

Tabulated data are provided on the incidence of *M. roreri* on the pods of 52 clones exposed to natural infection by the disease during 1956–58. No significant relationships were found between the extent of infection and the origin or type of clone. Clones showing least infection were EET306, EET36 and ICS48. SCA6, known for its high resistance to witches' broom, was one of the 16 clones with less than 10% infected pods.

5196 *Alvarado, R., Ampuero, E. & Doak, K. D. Reacción de diferentes clones y progenies híbridas a la buba o cushion gall del cacao. (The reaction of different clones and hybrid progenies to cushion gall of cacao). (pp. 290–301).*

At Pichilingue, Ecuador, 238 clones and 66 interclonal hybrids were examined for the presence of cushion gall. Symptoms of the disease were found in only 14 clones and 28 hybrids.

5197 *Glendinning, D. R. Plant breeding at the West African Cocoa Research Institute. (pp. 374–78).*

A short review is given of cacao breeding, since its initiation, at the above institute. Hybrids between Amazon types and between Amelonado and Amazon types are proving to be high in vigour and yielding capacity. Seed gardens of clones of the parents of the hybrids are being established in advance of the approval of the hybrids for issue, which will depend mainly upon quality, i.e. whether these new varieties may be mixed with Amelonado without impairing the uniformity of the West African crop. The aims of the next cycle of breeding, for which preparations are now being made, are outlined.

5198 *Jolly, A. L. & Verteuil, L. L. de Clonal and fertiliser experiments in Trinidad and Tobago. (pp. 390–418).*

A detailed report is provided on yield trials, chiefly on commercial estates, of older and more recently introduced clones of cacao. Observations on resistance to *Marasmius perniciosus* are included.

5199 *Monge S., F. Nota sobre la sensibilidad del cacao a las radiaciones gamma y su relación con el daño causado en el núcleo celular. (A note on the sensitivity of cacao to γ radiation and its relation to the damage caused in the cell nucleus). (pp. 419–22).*

Studies on the reaction of five cultivars to seed irradiation by γ rays indicated that Matina was most sensitive while UF613 was least sensitive. Cytological observations on the root tips showed that high sensitivity was correlated with a high frequency of chromosome bridges at anaphase.

5200 **Annual Report of the West African Cocoa Research Institute 1959–60** (1961) : Pp. 89.

In association with the programme of developing types resistant or tolerant in respect of black pod (*Phytophthora palmivora*), further work was carried out at Tafo, Ghana, on comparing isolates of the pathogen from widely separated areas [cf. 5202]. Some clones showing an encouragingly low incidence of black pod are to be used as parents in making crosses to give seedlings for a trial of resistance at Mpraeso. Analysis of data from the ninth progeny trial at Tafo indicated that, as would be expected, the faster-growing varieties came into bearing earlier and gave good early yields. Furthermore, yield was highly correlated with reduction in rate of growth after commencement of bearing. In a series of trials planted in 1953 and 1954, to compare Amazon varieties with local types, the former have shown better growth, as indicated by stem diameter. Evidence has been obtained that inbreds, although themselves reduced in vigour, may be satisfactory parents. In work on hybrid vigour, many parents were crossed in various combinations, the hybrid seedlings being compared with open-pollinated Amelonado for growth rate. It was possible in some cases to demonstrate significant variation between parents with respect to the vigour of their crosses. According to assessments by manufacturers, some of the new hybrid WACRI varieties are virtually indistinguishable from West African Amelonado, so that they can be issued without detriment to the uniformity of the exported crop. Growth records on the new WACRI varieties in trials away from Tafo, elsewhere in Ghana and also in Nigeria, suggest that these varieties may be suitable for wide issue. Study on the F_1, F_2 and F_3 of the Amazon hybrid T82 (Nanay 32 x Parinari 35) showed the F_1 to be superior to the other two generations in vegetative vigour. The breeding programme is at present aimed at producing F_1 hybrids for issue to the farmers. These results therefore underline the likelihood of a substantial reduction in vigour if later generations are grown. At Ibadan, Nigeria, observations were made on the reaction of various types to swollen shoot. The Trinitario group may be a potential source of tolerance; further selection may reveal outstanding clones for hybridizing with tolerant Amazon types. The reaction of the different Amazon populations has been very variable and only tentative conclusions can be drawn at present.

5201 Braudeau, J.
L'extension et l'amélioration de la culture du cacaoyer à Madagascar. **(The extension and improvement of cacao cultivation in Madagascar).**
Café, Cacao, Thé 1961 : **5** : 82–101.

A breeding programme designed to improve cacao populations in Madagascar is proposed. A brief account is given of breeding and selection work now in progress at the Ambanja Station.

5202 TURNER, P. D.
Complementary isolates of *Phytophthora palmivora* from cacao and rubber, and their taxonomy.
Phytopathology 1961 : **51** : 161–64.

The results of an examination of 235 isolates of *Ph. palmivora* from 22 countries are reported from the West African Cocoa Research Institute; 225 isolates were from cacao and the remaining 10 from rubber [cf. XXX, 4183; XXXI, 776]. No single isolate produced oospores. On the basis of oospore production by paired cultures on 4% oatmeal agar at 15–16° C., the isolates could be divided into three groups. All crosses between isolates of groups I and II resulted in oospore production, usually in abundance. Isolates in group III were atypical in several respects and failed to produce oospores when crossed with one another or with members of the other two groups. No intercrosses within group I resulted in oospores; a few pairings within group II led to oospore production. All isolates in group I probably represent the same strain, with slight variation according to country. Group II, however, consists of a heterogeneous collection. Excluding group-III isolates, because they are possibly distinct from *Ph. palmivora*, it is concluded that at least four strains are to be found on cacao and rubber. Justification for raising isolates from the two hosts to varietal status within *Ph. palmivora* is considered to be inadequate.

5203 MICHALSKI, T.
Wpływ promieni jonizujących na zawartość morfiny u maku lekarskiego (*Papaver somniferum* L.). [**The influence of ionizing rays on the morphine content of poppy (*P. somniferum* L.)**].
Biul. Inst. Roślin Leczn. 1960 : **6** : 169–75.

At the Polish Institute of Applied Botany and Acclimatization, irradiation of seeds with doses of 15 Kr. from Co^{60} resulted in four types of mutants: (1) *nana* mutants; (2) mutants displaying an alteration in flower colour; (3) mutants showing degeneration of the reproductive organs; and (4) biochemical mutants. Among the last mentioned were three plants designated I_1, I_2 and I_3 with morphine contents of 0·600, 0·540 and 0·535% respectively, compared with 0·320% in the controls. A slight decrease which occurred in the X_2 is attributed to unfavourable weather conditions.

5204 VOŠKERUŠA, J.
[**The problem of studying the morphine content in ripe seed capsules of poppy (*P. somniferum* L.)**].
Za socialist. sel'skohozjajstv. Nauk. (For socialist agric. Sci.), Praha 1961 : **10** : 143–50. [Russian].

Although the morphine content of poppy seeds is a varietal character, it was also found to be greatly affected by ecological conditions. Of the varieties tested, Dubský stříbrošedy [Dubský Silver-grey] had the highest morphine content. There was a significant positive correlation between the morphine content of the seed and the total production of seed and oil.

5205 PERSECĂ, E., MLEŞNIŢĂ, L. & MLEŞNIŢĂ, V.
Comportarea unui sortiment de mac la atacul ciupercii *Pleospora papaveracea* (De Not.) Sacc. [**The behaviour of a poppy collection in response to infection by the fungus *P. papaveracea* (De Not.) Sacc.**].
Lucrăr. şti. Inst. agron. P. Groza, Cluj 1960 : **16** : 201–05.

Observations on the incidence of natural infection of a series of varieties in 1957–59 are reported. The varieties least affected were Măgurele, Cluj A and Cluj R.

5206 ONO, T.
The hop in Japan.
Bull. Brew. Sci., Tokyo 1959 : **5** : 1–11.

This article includes information on the morphological and chemical characters of varieties in Japan. Investigations on pathology, polyploids and sex chromosomes are among the basic researches briefly outlined.

5207 HUSAR, M.
Rezultati ispitivanja uticaja specijalnih agromera na povećanje prinosa nekih ranijih i kvalitetnih sorti hmelja u uslovima Vojvodine. (**The results of investigations on the influence of special agronomic measures on raising the yield of some early and high-quality hop varieties in the region of Vojvodina**).
Savremen. Poljopr., Novi Sad 1961 : **9** : 203–15.

Grafting Northern Brewer and Slovenian Golding on to the local Petrovac variety raised the yield of the scion varieties by 291 and 212% respectively; quality was also improved.

5208 Mori, Y.
(Experiments on the germination of hop pollen).
Bull. Brew. Sci., Tokyo 1959 : **5** : 37–42. [Japanese].

The optimum conditions for germination were found to be a 1% agar medium with 0·4 mol. sucrose, pH 5·2 and 30° C.

5209 Mori, Y.
(The pubescence types of plants related to hops).
Bull. Brew. Sci., Tokyo 1959 : **5** : 13–35. [Japanese].

A survey of cultivated and wild forms has revealed the following pubescence patterns: (1) glabrous; Italian wild hops, European cultivars and some Japanese cultivars; (2) moderate pubescence, denser on upper side of node, American wild hops, and some American, English and Japanese cultivars; (3) moderate pubescence, denser on both sides of node, Japanese wild hops and the American cultivars Sonoma; (4) moderate pubescence, with denser edge lines, Canadian wild hops, a Canadian cultivar and some American and English cultivars; and (5) dense pubescence, *Humulus japonicus*. A correlation was noted between pubescence and greater leaf dissection.

MINOR CROP PLANTS

5210 Nevstrueva, R. I.
(Lavenders along the south coast of the Crimea).
Agrobiologija (Agrobiology) 1960 : No. 1 : p. 147. [Russian].

Heterotic *Lavandula vera* x *L. spica* hybrids have been found in the Crimea. The plants, which arose by natural hybridization, are sterile and reproduce vegetatively. Selected forms have been used as planting material for the first Soviet lavender fields.

5211 Dimitrova, E.
(A new form of *Lavandula vera* L.).
CR Acad. bulg. Sci. 1960 : **13** : 347–50 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 830 : p. 49. [French]. (Mimeographed).

A form which blooms twice in one growing season has been discovered; this character is inherited. The quantity of flowers produced in the second flowering depends on environmental conditions but the content of oil and linalyl acetate is similar to that of the first harvest.

5212 Gărbutov, P.
(High yields from the new sweet pepper varieties).
Gradinarstvo (Horticulture) 1960 : **2** : No. 6 : p. 24 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 850 : 60–61. [Bulgarian]. (Mimeographed).

The new hybrid varieties tested and in particular D–103 x Sivria 600, D–103 x Kalinkov, D–103 x Bjala kapija [White Drop], D–103 x Kurtovska kapija and D–103 x Pasardžiška kapija were superior to the older varieties in productivity and earliness.

5213 Yagishita, N.
Studies on graft hybrids of *Capsicum annuum* L. I. Variation in fruit shape caused by grafting and the effects in the first and second seed generations.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1961 : **74** : 122–30.

The effects of grafting between *C. annuum* var. *fasciculatum* 'Yatsubusa' and var. *grossum* 'Spanish Paprika' upon fruit shape were investigated at the Biological Laboratory, Tokyo University of Agriculture and Technology. Grafted plants were grown in isolation in the greenhouse and artificially selfed early in the morning. One of the plants of Yatsubusa used as stock bore fruits showing modifications in shape, together with normal fruits. One of the former fruits was of the Spanish Paprika type; the others were round or sunken at the apex. One of the plants of Yatsubusa grafted as scion also bore two modified fruits. Observations were made on the S_1 and S_2 derived from the first-mentioned plant, seeds in the individual fruits being sown separately. The alterations in fruit shape persisted in both generations. This variation was not seen in the controls and their S_1 and S_2, and the variation in this character in the F_1 obtained by sexual crossing between the two varieties was essentially different from that associated with grafting.

5214 Aleksić, D.
Indukcija tetraploidije kod paprike.
(The induction of tetraploidy in red pepper).
Arh. poljopr. Nauk. 1960 : **13** : 106–13.

A tetraploid was obtained by treatment with a 0·8% solution of colchicine and two further polyploid generations were bred from this plant. The tetraploids showed more luxuriant growth than the diploids, having larger leaves, stomata, flowers and seeds and a longer flowering and fruiting period. The fertility of the tetraploids was somewhat lower than in the diploids and the fruit smaller with a lower average weight; the flesh however was thicker. It is thought that the fertility and quality of the tetraploids will improve in later generations. Multivalents were rare in meiosis.

5215 SCHMIDT, G.
Fűszerpaprikafajták termésformavariabilitásának vizsgálata. **(A study of the variability in fruit form of varieties of red pepper for condiment).**
Agrobotanika, Tápiószele 1959 : **1** : 193–206. (Mimeographed).

Seven types of fruit form were distinguished, the best being that with a conical calyx tube and a straight fruit axis. Among ten nonpungent Hungarian varieties, E 15 had the highest proportion of fruits of this type.

5216 ŽDANOV, L. A.
(The basic tasks in breeding oil crops in the USSR).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 6 : 46–52. [Russian].

Reference is made to the production of sunflowers such as Don 8281, resistant to races A and B of broomrape and giving seeds with an oil content of 33·17–43·11%. The oil content in some of the most recent varieties varies from 52 to 56% and varieties are mentioned which combine high oil content with resistance to broomrape, early ripening, low stature, rust resistance and other desirable attributes.

Varieties with improved oil content have been produced in linseed, castor-oil plants, Indian mustard and a number of other oil plants.

Improvements in yield of inbred lines and intervarietal hybrids have been effected by the addition of pollen of maize and certain other plants to the pollen used for pollinating sunflowers; similar improvements are reported from pollinations of sesame by the addition of pollen of *Hibiscus syriacus* or *Antirrhinum majus*.

5217 Jord—Gröda—Djur. Aktuella praktiska resultat från svensk jordbruksforskning. Årsbok 1961. **(Soil—Crops—Animals. Current practical results in Swedish agricultural research. Yearbook 1961).** Pp. 319.

Andersson, G. Förädling av oljeväxter. (Breeding of oil plants). (pp. 59–68).

An outline of breeding objectives and methods is presented, together with information on current Swedish varieties of swede rape, turnip rape, mustard, *Camelina sativa* and linseed.

5218 MANŽELIJ, I. I.
(An eminent scientist and plant breeder of our country).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1960 : No. 2 : 59–60. [Russian].

A biography of L. A. Ždanov, written on the occasion of his 70th birthday, mentions improved varieties of oil plants which he bred at Rostov in recent years, in particular sunflowers rich in oil and resistant to *Orobanche*, indehiscent varieties of castor oil suitable for combine harvesting, the sesame variety Don 23 and three disease-resistant *Lallemantia* varieties.

5219 MOROZOV, V. K.
(*Camelina sativa* with winter habit from an altered spring form).
Agrobiologija (Agrobiology) 1960 : No. 2 : 227–31. [Russian].

Saratovskij Ozimyj [Winter Saratov] was obtained by training the spring variety R2 for the winter habit. It is more productive of seed and has a higher oil content than the winter variety Zavolž'e.

5220 MOHANTY, R. N., SATPATHY, D. & MISRA, B.
Preliminary observations on induction of polyploidy in niger.
Indian Oilseeds J. 1961 : **5** : No. 2 : 87–90.

Of the 95 plants of *Guizotia abyssinica* surviving treatment of the seeds or seedlings with colchicine, three were tetraploids ($2n = 60$). Compared with the diploids they were later in flowering, taller and more vigorous, with larger organs, except in the case of the flowers. The $4x$ plants had an average of 6_{IV} per cell at metaphase I. A few laggards were observed at anaphase I. Pollen sterility was high and seed sterility complete in the tetraploids. The failure to set seed is ascribed to meiotic irregularity, the small number of $4x$ plants available for intercrossing and absence of pollinating insects.

5221 PATHAK, G. N. & SINGH, D. N.
Improved early varieties of rai and yellow sarson in Uttar Pradesh.
Indian Oilseeds J. 1961 : **5** : No. 1 : 45–49.

Varietal trials have shown the rai Type 16 (*Brassica juncea*) to be an improvement in earliness and other respects over other varieties in eastern Uttar Pradesh. On account of its early maturity, the yellow sarson Type 42 (*B. campestris*) has been chosen as an improved variety not only for the eastern part of the state but also for the dry tracts. Type 16 requires about 130 days from sowing to maturity, and Type 42 about 120–125 days. Both varieties are the results of selecting local material.

5222 Dharampal Singh

An apetalous mutation in tora brown sarson (*Brassica campestris* var. brown sarson) and its inheritance.

Curr. Sci. 1961 : **30** : 62–63.

The apetalous condition was associated with a reduction in the number of stamens. The condition was inherited monogenically and was recessive. Pod and seed setting were normal.

5223 Pathak, M. D.

Preliminary notes on the differential response of yellow and brown sarson and rai to mustard aphid (*Lipaphis erysmi* Kalt).

Indian Oilseeds J. 1961 : **5** : No. 1 : 39–44.

The reactions of about 40 varieties of yellow and brown sarson (*Brassica campestris*) and of Indian mustard (*B. juncea*) to the above pest are described. In general, the mustard varieties were much more resistant than varieties of brown or yellow sarson. Broadly speaking, resistance appeared to be dependent on tolerance, but in each crop several varieties were resistant not only because of tolerance but also because of some additional factor, since they had low numbers of aphids and were also less damaged. The occurrence of resistant individuals in susceptible varieties of brown and yellow sarson suggested scope for breeding.

5224 Rajan, S. S. & Rao, S. B. P.

"Xenia" in oleiferous *Brassicae.*

Indian J. Genet. 1961 : **21** : 52–58.

Data on siliqua size, seed number and seed weight in the female parents in different types of pollinations of 4*x* *Brassica campestris* var. *toria*, ranging from completely assortative to completely random matings, provided no evidence of metaxenia. The report by Singh [XXVIII, 840] that xenia, or more strictly speaking metaxenia, occurred in interspecific and intraspecific crosses of oleiferous *Brassica* crops was therefore not confirmed.

5225 Špota, V. I.

(Creation of a winter form of mustard by the method of distant hybridization).

Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 5 : 131–33. [Russian].

In crosses of Indian mustard, *Brassica juncea* 'Neosypajuščajasja 2' [Nonshedding 2] with local Ukrainian forms of winter swede rape, *B. napus*, a set of 68% was obtained when the pollination was repeated after 24 hr., preferably with the addition of pollen from some other plant such as white mustard or poppy. The hybrids displayed heterosis but were largely self sterile. They were somewhat reduced in winter hardiness and behaved as alternative forms; their oil content was inferior to that of the parents.

The F_2 generation contained a wide range of types, which varied according to which parental species was used as pollinator. In the progeny from open pollination with *B. juncea* a certain number of winter forms occurred. Plants showing transgression for such characters as earliness, yield, oil content and seed size were selected; some of them had a content of essential oils exceeding that of the parents by up to 33%.

Winter forms appeared also in the F_3, some of them having a longer vernalization stage than winter rape. Some lines have shown complete fertility.

5226 Palmer, T. P.

Aphis resistant rape.

NZ J. Agric. 1960 : **101** : 375–76.

Detailed information is given on the development and performance of Aphis Resistant [(Calder swede x Superlative swede) x Clubroot Resistant rape], possessing resistance to *Brevicoryne brassica*, derived from Calder [cf. 1578].

5227 Stein, H.

Spininess in *Ricinus* as a morphogenetic model.

Bull. Res. Counc. Israel 1961 : **9D** : p. 195. (Abst.).

At locus *S* for spine development on the capsule, four alleles have been detected: *S*, for spiny capsule; s^{r}, rendering the majority of the capsules spineless; and *s* and s^{f}, each causing a completely spineless condition [cf. XXX, 1863]. *S* is partially dominant, the number of spines decreasing in the order $SS > Ss^{r} > Ss > Ss^{f}$. In Ss^{f} plants, spine number within each plant increases from the first raceme to later ones and within each raceme from the first capsule to later ones. Continuous removal of most leaves caused a pronounced inhibition of growth and highly significant increase in spine number. Gibberellin treatment or pruning resulted in stimulation of growth and a non-significant decrease in spine number. It is assumed that spine formation is determined by a substance produced in the vegetative parts, which may be identical with one of the growth substances. This assumption may also be tested by local application of growth substances. Attention is drawn to the potential value of spine development as a morphogenetic model.

5228 Aiyadurai, S. G., Navakodi, K. & Krishnaswami, P.
Inheritance of the purple pigmentation on the spines of the capsules of *Ricinus communis* Linn.
Madras agric. J. 1961 : **48** : 102–03.

Two varieties with green capsules and purple spines were crossed with an ornamental type with "sulphur-white" capsules lacking purple pigmentation of the spines. Purple colour of the spines proved to be a dominant monogenic character.

5229 Stein, H.
Castor bean seedlings as a teaching aid.
J. Hered. 1961 : **52** : 36–38.

Two recently discovered recessive genes for colour at the seedling stage, m^p (pure green) and *ag* (anthocyanin glands), may prove useful for the demonstration of dihybrid segregation and gene interaction [XXX, 1864]. The phenotypes in question are: red hypocotyl and no red dots on the upper surface of the cotyledon (*M Ag*); red hypocotyl and red dots on the upper surface of the cotyledon (*M ag*); green hypocotyl and no trace of anthocyanin visible at the seedling or any other stage (m^p *Ag*); and green hypocotyl and red dots which appear at the nodes within three weeks after emergence (m^p *ag*). The possible value of a third gene, *n* (noncoloured), in genetical instruction is also discussed [cf. *loc. cit.*]. In the present paper, the main effect of *n* is described as partial suppression of chlorophyll production in the sepals, capsules and cotyledons.

5230 Chandramouli, N., Ganga Prasada Rao, B. V., Ramana Rao, & Razvi, H. A.
Fast neutron-induced morphogenetic effects in castor.
Indian Oilseeds J. 1961 : **5** : No. 2 : 96–105.

A report is given on the physiological, morphological and cytological effects observed in the R_1 as the result of exposing seeds of a single variety (HC1) to fast neutrons. The investigations represent the initiation of a project undertaken at the department of Agricultural Botany, Osmania University, Hyderabad, to explore the possibilities of improving the castor-oil plant by induced mutation. The chimeral occurrence of the completely pistillate condition and lack of bloom on the plant parts is attributed to possible mutations at heterozygous loci. The possibility of isolating 100% pistillate plants in subsequent generations is visualized; such plants could be used in the production of F_1 hybrid seed. Cytological abnormalities such as stickiness, polyploidy, inversions, translocations and unequal separation of the chromosomes were observed in the PMCs.

5231 Stein, H.
Sterility in a cross between distant ecotypes in *Ricinus*.
Bull. Res. Counc. Israel 1961 : **9D** : p. 199. (Abst.).

The following case of sterility in a cross between ecotypes is considered to be of taxonomic and evolutionary interest. In one parent, Early Spineless, which probably originated in China, all developmental processes were accelerated. In the other parent, Green Sudanese from Africa, all these processes were retarded. The F_1 from both directions of the cross and all F_2 plants of Early Spineless ♀ x Green Sudanese ♂ were fertile. In the F_2 of Green Sudanese ♀ x Early Spineless ♂, 19 out of 91 plants were pollen and ovule sterile. Early Spineless is assumed to carry a recessive gene, *a*, which in the presence of the cytoplasm of Green Sudanese causes sterility. This hypothesis is being subjected to experimental test. If confirmed, "it may indicate a beginning separation of the species."

5232 Jakob, K. M.
A trisomic plant in *Ricinus communis* L.
Bull. Res. Counc. Israel 1961 : **9D** : 198–99. (Abst.).

A plant trisomic for a single chromosome, probably C, was derived by open pollination from a morphologically normal but highly sterile complex trisomic, which had originated from a cross between a colchicine-induced autotetraploid and a normal diploid of the variety Adamdam. The inflorescences of the simple trisomic lack ♀ flowers, having only ♂ flowers and an occasional single ☿ flower near the raceme tip. Capsules from the ☿ flowers drop off before maturation. Although having fewer anthers and less pollen per anther than normal ♂ flowers, the trisomic is at least partially ♂ fertile.

5233 Jarry, A.
Influence des conditions climatiques sur la sélection du ricin au Dahomey. (**The influence of climatic conditions on breeding the castor oil plant in Dahomey**).
Oléagineux 1961 : **16** : 167–72.

A brief account is given of selection within the local, perennial types adapted to the climatic conditions of Dahomey, and of hybridization between these and imported annual varieties [cf. XXX, 1862]. One line has been obtained which gives a sufficiently high percentage of female clones to enable hybridization plots to be established.

5234 Pathak, G. N. & Gangwar, L. C.
New improved varieties of sesame for Uttar Pradesh.
Indian Oilseeds J. 1961 : **5** : No. 2 : 91–93.

T4 and T12 show improvements in yield and oil content over T10 and the local varieties in the alluvial tracts. Unlike T10, both new selections are also suitable for the Bundelkhand region, which is the chief sesame-growing area in Uttar Pradesh.

5235 Mazzani, B.
Variaciones del contenido en aceite de la semilla en cultivares locales de ajonjolí. II. Su correlación con otras características de la planta. (**Variations in the seed oil content of local sesame cultivars. II. Correlation with other plant characteristics**).
Agron. trop., Venezuela 1959 : **9** : 87–92.

High seed oil content in a group of 10 Venezuelan cultivars was found to be positively correlated with profuse branching and, to a lesser extent, with small seed. No correlations appeared to exist between seed oil content and plant height, height of first fruit or seed yield [cf. 2441].

5236 Matsuoka, K.
(**Studies on sesame varieties. X. On varietal distribution and response to photoperiod and temperature**).
Nogyo Kisho/J. agric. Met. 1960 : **16** : 27–33. [Japanese].

Vegetative period, leaf number and plant height of ten varieties from nine countries were ascertained in sowings made at 5-day intervals from 23 May to 7 September. Some correlation between photoperiodic requirement and latitude of origin of the varieties was noted.

5237 Ho, K. & Matsuoka, K.
(**Studies on sesame varieties. XI. On intervarietal differences in the drought resistance of sesame**).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 15–26. [Japanese].

A series of 43 varieties from Japan and elsewhere was investigated. Resistance was found to be associated with tropical provenance, high oil content of the seed and high root/top ratio; it was negatively correlated with resistance to the toxic action of $KClO_3$ solution, germinability and rate of water absorption.

5238 Matsuoka, K., Tanaguchi, N., Kawakami, M. & Ito, K.
(**Studies on sesame varieties. XII. On the classification of sesame varieties with regard to number of days to flowering and maturity, and oil content**).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 27–46. [Japanese].

A series of 105 Japanese and introduced varieties were studied and classified into groups on the basis of the characters cited above.

5239 Matsuoka, K. & Ito, K.
(**Studies on sesame varieties. XIII. On the geographical distribution of sesame and various characteristics**).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 47–64. [Japanese].

A series of 43 varieties from Africa, Indonesia, India, China, Japan, Korea, Israel, the USSR and the USA was studied in respect of oil content, 1000-seed weight, number of stomata, capsule length, stigma length, plant height, flowering period, germinability, reaction to $KClO_3$ solution, resistance to drought and *Pseudomonas sesami*, and ratio of yields under wet and dry conditions. Two intersecting varietal groupings were made, one depending on temperate *v.* tropical adaptation and the other on dry *v.* rainy-season adaptation.

5240 Matsuoka, K., Taniguchi, N. & Ito, K.
(**Studies on sesame varieties. XIV. On the development of the root system, intervarietal differences in this respect, and its relations with some other plant characters**).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 65–78. [Japanese].

Forty-three Japanese and foreign varieties were studied, eight in special detail. The most profuse root development was found in varieties adapted to tropical and dry-season climates, in drought-resistant varieties and in forms with a high oil content in the seeds. Intervarietal differences in root development at various stages in the vegetative cycle were also noted.

5241 MATSUOKA, K., KAWAKAMI, M. & ITO, K.
(Studies on sesame varieties. XV. On the response of sesame to photoperiod and temperature under field conditions).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 79–94. [Japanese].

A series of 35 varieties from nine countries were grown at 5-day intervals from 23 May to 7 September. Tropical varieties were sensitive both to photoperiod and temperature. Far Eastern varieties were sensitive to temperature but less so to photoperiod. Varieties from Israel and the USSR showed reduced sensitivity both to photoperiod and temperature.

5242 CLARIDGE, J. H. & COTTIER, K.
Results from three years of linseed variety trials.
NZ J. Agric. 1961 : **102** : 381, 383.

In 9-entry trials conducted at 13 New Zealand centres between 1957 and 1960, highest yields were obtained from Redwood and Rocket. Marine was the lowest-yielding variety but was earlier and more resistant to lodging than any other.

5243 COMSTOCK, V. E.
Early generation selection for high oil content and high oil quality in flax.
Tech. Bull. Univ. Minn. agric. Exp. Sta. 1960 : No. 234 : Pp. 26.

Investigations are reported on the inheritance of and degree of association between oil content and iodine value in F_2 and F_3 progenies derived from crosses of Redwood and Marine with CI1455. Oil content data revealed wide variability among F_2 and F_3 plants, much of it due to genetic differences; estimates of oil-content heritability ranged as high as 67%. By selecting the best 10% of F_2 plants as progenitors, the oil content of F_3 plants was increased by an average of approximately 1·5%. A high degree of association between yellow seed colour and high oil content was observed in the progenies of both crosses. It is pointed out that several undesirable characteristics are associated with yellow seed. CI1455, which is a yellow-seeded variety, does appear to possess high-oil genes which are inherited independently of seed colour. The degree of association between seed weight and oil content was of a low order.
Oil content and iodine value (IV) segregated independently within seed-colour classes, indicating that it is possible to combine the two properties. IV was somewhat less heritable than oil content, particularly in the Redwood x CI1455 cross. It was shown that Marine would be superior to Redwood in a breeding programme designed to improve IV. Correlation data indicated that IV could also be increased by selecting for yellow seed colour; the unfavourable characteristics referred to above rule out this procedure. A significant negative association between seed weight and IV was obtained, indicating that selection of small-seeded plants would result in a higher IV. Because of a tendency towards a simultaneous decrease in oil content, this technique would be impractical, unless high IV was the most important objective. It is suggested that the selection of high IV genotypes on the basis of laboratory estimations on small seed samples would be a suitable and practical procedure.

5244 PLONKA, F.
Obtentions récentes de variétés de lin oléagineux et orientation des sélections en cours. **(Recently obtained linseed varieties and trends concerning the current selections).**
Oléagineux 1961 : **16** : 261–62.

Lilas, a new variety developed by the firm of Tourneur, is superior to Pervenche and Maroc in yielding capacity and in percentage oil content. Developed by the Union of Seed Cooperatives of Versailles, Gentiane is early maturing and produces moderate yields. It is less susceptible to *Septoria lini* than Pervenche or Maroc. Gentiane may be sown in autumn in areas with mild winter conditions. Crocus, a high-yielding variety, and Océan, a cold-resistant selection, may be released soon. The possibilities of developing improved *Linum* varieties, suitable for both fibre and oil production, are discussed.

5245 PATHAK, G. N. & GANGWAR, L. C.
New improved varieties of linseed for Bundelkhand region of Uttar Pradesh.
Indian Oilseeds J. 1961 : **5** : No. 2 : 106–07.

Each selected from a cross, T397 and T603 are suitable for the Bundelkhand region, where they have surpassed T1 and the local type in both yield and oil percentage. Both new varieties are rust resistant.

5246 Gursham Singh, & Khem Singh Gill
Study of seed colour in linseed in relation to quantity and quality of oil.
Indian Oilseeds J. 1961 : **5** : No. 1 : 31–33.

Study of 190 F_3 cultures from crosses of the brown-seeded variety K–2 with three yellow-seeded varieties showed high oil content to be positively and significantly associated with yellow seed colour. Iodine value was determined in 96 F_3 cultures from two of the crosses. The relationship between yellow seed colour and higher iodine value was positive but not significant.

5247 Merh, J. L. & Kulkarni, S. N.
Varietal resistance of linseed to wilt and rust: II.
Indian Oilseeds J. 1961 : **5** : No. 1 : 25–26.

A summary is given of the results of tests carried out during 1955–59 on the reactions of 118 varieties to *Melampsora lini* and *Fusarium oxysporum* var. *lini* at the Institute of Plant Industry, Indore.

5248 Voisin, J.-C.
Perspectives nouvelles en France pour le tournesol. (**New possibilities for the sunflower in France**).
Oléagineux 1961 : **16** : 263–64.

Trials at Lavalette in 1960 indicated that the Russian varieties Ždanov, VNIIMK 4966 [All-Union Research Institute for Oil Crops 4966] and VNIIMK 6540 and the variety Bulgare were superior in yield and quality to French and German lines. The possibilities of utilizing these and other results for the improvement of sunflower in France are discussed.

5249 Pustovojt, V. S.
(**The results of work on breeding and seed production of sunflower**).
Agrobiologija (Agrobiology) 1960 : No. 3 : 332–34. [Russian].

The oil content in varieties 1646, 3497, 6540 and 8931 has been increased by 5% in recent years. The growth periods of these varieties have been shortened by 6 days and *Orobanche* resistance raised by 15–18%. The resistance to *Homeosoma* has been also greatly improved, especially in 1646.

5250 Nicolić-Vig, V.
Rezultati prve godine gajenja sovjetskih sorti suncokreta na teritoriji AP Vojvodine u 1960 godini. (**First-year results of trials of Soviet sunflower varieties in the Autonomous Republic of Vojvodina in 1960**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 980–87.

Ten Russian sunflower varieties were very similar in seed-yielding capacity to three local lines. However, the Russian varieties were markedly superior to the Yugoslav lines in oil content and thus in oil yield per hectare. The outstanding Russian variety was VNIIMK 8883 [Oil Plants Institute 8883].

5251 Stebbins, G. L. & Daly, K.
Changes in the variation pattern of a hybrid population of *Helianthus* over an eight-year period.
Evolution, NY 1961 : **15** : 60–71.

The population studied resulted from repeated natural crossing between two cross-fertilizing annual species, *H. annuus* and *H. bolanderi*. These species hybridize readily but seed and pollen fertility in the F_1 hybrids is very low. In the present population, partial stabilization of intermediate phenotypes occurred despite repeated cross fertilization, and pollen fertility increased significantly in these types. This suggests that, given a sufficiently large population and a fairly strong selective pressure favouring the intermediate types, chromosomal differences responsible for F_1 sterility may be overcome by segregation and selection in a cross-fertilizing population.

5252 Georgieva-Todorova, I.
(**Experiments with grafting *H. annuus* on *Xanthium strumarium***).
CR Acad. bulg. Sci. 1960 : **13** : 351–54 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 810 : p. 36. [English]. (Mimeographed).

H. annuus 'VNIIMK 6540' [Oil Plants Institute 6540] grafted on to *X. strumarium* was shorter, ripened earlier and produced a lower proportion of husk than nongrafted plants.

5253 Beneckaja, G. K.
(**Problems on floral biology in sunflower**).
Agrobiologija (Agrobiology) 1960 : No. 2 : 266–67. [Russian].

Armenian observations on the maturation of sexual elements in sunflower and pollination by bees indicate that dichogamy does not necessarily ensure cross fertilization, as through the action of insects both foreign and self pollen reaches the stigma.

5254 HABERMANN, H. M.
Spectra of normal and pigment-deficient mutant leaves of *Helianthus annuus* L.
Physiol. Plant. 1960 : **13** : 718–25.

In further studies on chlorophyll mutants of *H. annuus* [cf. XXIX, 2983], it is shown that small amounts of chlorophyll are present in mature leaves of the yellow mutant grown in full sunlight. The presence of protochlorophyll in white mutant seedlings grown in the dark was confirmed and the conversion of protochlorophyll to chlorophyll in the light was demonstrated in intact cotyledons; absorption spectra of white mutant material grown in full sunlight, however, showed no evidence of any of the normal plastid pigments.

5255 DUBLJANSKAJA, N. F.
(The linoleic acid and tocopherol content of the oils of different sunflower varieties).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 6 : 123–26. [Russian].

In addition to a review of Russian and foreign studies, mention is made of two separate 4-entry trials. In one, VNIIMK 15659 [All-Union Oil Plants Research Institute 15659] was highest in total oil yield and linoleic acid content, while in the other VNIIMK 8931 had the highest percentage of tocopherols (vitamin E). Another investigation demonstrated the substantial influence of geographical and climatic factors on oil content and composition. It is pointed out that selection for high oil content generally results in a simultaneous increase in the proportion of linoleic acid and tocopherols in the oil.

5256 PUSTOVOJT, V. S.
(Methods of producing sunflower varieties immune to the main diseases and pests).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 10 : 26–38. [Russian].

The oil yield from the newer cultivars characterized by resistance to the complex of races A and B of broomrape and to sunflower moth exceeds that of the old varieties by 42–72%, their seed yield being roughly the same. A brief outline is given of the way in which they were produced by selection in broomrape infested fields; the B complex of races was discovered in 1925 and only those stations that have carried out selection on fields infested with this complex too have succeeded in selecting resistant forms.

Attempts to select rust-resistant forms on similar lines have not been successful. Resistant wild sunflowers from Texas, after selection for moth resistance, have been used in crossing with the local species; after back crossing to the local species and selection over a number of generations some lines have been obtained which combine resistance to rust, drought, and shedding with various other desirable features and exceed standard broomrape-resistant varieties such as VNIIMP 8931 [All-Union Research Institute for the Oil Industry 8931] in yield of both seeds and oil. Some of the hybrids also combine resistance to rust, broomrape and moth.

Several crosses have been made between the sunflower and *Helianthus tuberosus*. Most of them were sterile in the F_3 and later generations; this was overcome by previously grafting the sunflower on the artichoke and in these crosses fertile plants of the sunflower type were obtained in the F_4 and later generations and some of them proved resistant to downy mildew; by crossing them with other selections forms resistant to broomrape, rust and downy mildew have been produced. Some of the hybrids have a high hectolitre weight, in certain cases reaching 560–600 g.

Hybrids have also been obtained between the sunflower and *H. tomentosus*.

5257 ASHRI, A.
Variability in *Carthamus* spp. in the Galilee.
Bull. Res. Counc. Israel 1961 : **9D** : p. 198. (Abst.).

Evidence has been obtained of hybridization between *C. glaucus* and *C. tenuis* and of subsequent introgression.

5258 CHAUDHARI, B. B., PATIL, J. A. & CHAVAN, V. M.
A new improved strain of safflower '62–8'.
Indian Oilseeds J. 1961 : **5** : No. **1** : 34–36.

Selected from local material collected in Maharashtra State, Niphad 62–8 has shown a 17% and 6·2% superiority over the standard variety N630 in yield and oil content, respectively. It is widely adapted in the State.

5259 Ashri, A.
The susceptibility of safflower varieties and species to several foliage diseases in Israel.
Plant Dis. Reptr. 1961 : **45** : 146–50.

The susceptibility of 39 varieties and lines of *Carthamus tinctorius* and six wild *Carthamus* species to natural infection by the following pathogens is reported: *Puccinia carthami*, *Ramularia carthamicola*, *Alternaria carthami* or *Stemphylium* sp. (it could not be determined which of these two pathogens caused the primary infection), *Erysiphe cichoracearum* f. *carthami* and *Cercospora carthami*; the occurrence of a disorder designated "white spots", which is thought to be physiological or nutritional, was also recorded. No rust-resistant varieties or wild species were found, although infection was slight in the Australian varieties 23(1)B and 23(3)–5. A number of varieties, as well as *C. nitidus*, *C. glaucus*, *C. tenuis* and *C.* ? (a species from Upper Galilee resembling *C. syriacus* and *C. alexandrinus*) were free of *Ramularia* infection. All varieties were infected by *Cercospora* but the Australian variety RR340–53 showed only a trace of infection; *C. nitidus*, *C. tenuis* and *C.* ? were not diseased. *Alternaria* (or *Stemphylium*) leaf spot appeared on all the varieties except the Indian strain UC57–146; *C. glaucus*, *C. tenuis* and *C.* ? were not infected. Powdery mildew occurred only in a few localized patches. All varieties, lines and species exhibited the white-spot disorder.

5260 Silva, H. L. e.
Melhoramento da palmeira-do-azeite (*Elaeis guineensis*) na Guiné Portuguesa. [**Improvement of the oil palm (*E. guineensis*) in Portuguese Guinea**].
Garcia de Orta 1960 : **8** : 411–19.

A comprehensive programme for oil-palm improvement, involving native and introduced *dura*, *pisifera* and *tenera* material, is proposed. Reference is made to breeding work in progress at research stations in West and Central Africa and in Indonesia, and its relevance to conditions and requirements in Portuguese Guinea.

5261 Ramachandran, K.
Chromosome numbers in the genus *Curcuma* Linn.
Curr. Sci. 1961 : **30** : 194–96.

Chromosome numbers are given for strains and varieties representing six *Curcuma* species: *C. decipiens*, *C. neilgherrensis* and *C. amada*, $2n = 42$; *C. zedoaria* and *C. longa*, 63; and *C. aromatica*, 63 and 86. The studies confirmed that the basic number of the genus is 21, although it is considered that this is probably not the primary number. No aneuploids were found in any of the triploid material, but both of the *C. aromatica* tetraploids examined had $84 + 2$ chromosomes; this is the highest chromosome number so far reported in this genus. Meiosis was studied in *C. decipiens* and *C. longa*. Pairing was regular in the former species, only bivalents being formed. In *C. longa*, a high percentage of trivalents was observed, indicating autotriploidy. It is not known whether two 63-chromosome forms, exhibiting characters intermediate between *C. longa* and *C. aromatica*, are hybrids between the two species, or represent intermediate forms in the evolution of one species from the other.

5262 Brooker, S. G. & Cooper, R. C.
New Zealand medicinal plants.
Econ. Bot. 1961 : **15** : 1–10.

A list of Maori medicinal plants is followed by a brief review of those plants, and the chemical substances found in them, which appear to be of potential value in chemotherapy.

5263 Alston, R. E. & Irwin, H. S.
The comparative extent of variation of free amino acids and certain "secondary" substances among *Cassia* species.
Amer. J. Bot. 1961 : **48** : 35–39.

Chromatographic analysis of *C. fasciculata* var. *ferrisiae*, *C. occidentalis*, *C. obtusifolia*, *C. corymbosa* and *C. lindheimeriana* suggested that variation in "secondary" substances would be more taxonomically significant than variation in free aminoacids. Substances not intimately involved in primary metabolic processes are referred to as secondary. They were viewed in visible light, visible light in ammonia vapour, long-wave ultraviolet and long-wave ultraviolet in ammonia vapour, and also after spraying the chromatograms with a general reagent for phenols.

5264 Boratyńska, W.
Zmienność zawartości chelidoniny w glistniku—jaskółczym zielu (*Chelidonium maius* L.), pod wpływem promieni izotopu kobaltu ^{60}Co. [**Variation in chelidonin content in greater celandine (*Ch. majus* L.) under the influence of the radioactive isotope of cobalt, Co^{60}**].
Biul. Inst. Roślin Leczn. 1960 : **6** : 255–62.

By means of seed treatment with Co^{60}, three mutants containing respectively 0·997, 1·037 and 1·535% chelidonin, compared with 0·222%

in the controls, have been obtained. Mutants with a decreased content were also found.

5265 RASH BEHARI GHOSH
Chromosome number of some flowering plants.
Curr. Sci. 1961 : **30** : p. 73.

The following chromosome numbers are reported: *Eupatorium odoratum*, $2n = 58$; *Walsura piscidia*, 28; *Bursera serrata*, 22; and *Garuga pinnata*, 26.

5266 DE SILVA, C. A.
The performance of RRIC clones under Ceylon conditions.
Quart. J. Rubb. Res. Inst. Ceylon 1961 : **37** : 1–12.

An account is given of the development and performance of rubber clones derived from unselected, near-legitimate and legitimate seedlings.

5267 **Planting recommendations 1961–62.**
RRI Plant. Bull. 1961 : No. 53 : 47–54.

Information is provided on rubber clones recommended for large or small-scale planting in Malaya.

5268 **RRIM 600 series clones.**
RRI Plant. Bull. 1961 : No. 53 : 58–63.

A report is given on the results of (1) the fifth year of tapping of rubber clones RRIM600–618 and (2) the fourth year of tapping of clones RRIM619–630 in trials at the Experiment Station of the Rubber Research Institute of Malaya [cf. XXX, 3031].

5269 MIKAILOV, M. A.
(A form of *Astragalus pycnophyllus* rich in gum).
Agrobiologija (Agrobiology) 1960 : No. 2 : p. 304. [Russian].

The above form was selected at the Baku Botanic Garden while testing the possibility of using *A. pycnophyllus* as a cultivated gum plant. It is distinguished by great vigour, increased seed production and a high gum yield as compared with other plants of the same species. The selected form is being reproduced.

FRUITS AND NUTS

Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1959 to 30th September, 1960 (1961) : Pp. xxiv + 148.

5270 *Part II. Pomology.* (*pp. 7–12*).

Apple. A major gene for resistance to *Venturia inaequalis*, which was derived from *Malus floribunda* by American workers, is being transferred to varieties of English origin with a view to its ultimate incorporation in material being raised at East Malling. Sources of major genes for resistance to *Podosphaera leucotricha* are also being sought. Crosses between Northern Spy and several rootstock varieties exhibiting either resistance or susceptibility to woolly aphids (*Eriosoma lanigerum*) have been made for histological and entomological studies.

Plum. An East Malling seedling, E296, which produces leaves and flowers simultaneously, gave good yields in a year when the occurrence of frosts and cold winds during and immediately after blossoming reduced the yields of other varieties.

Cherry. Of about 1200 seedlings from crosses between selected mazzard clones from which it is hoped to select improved rootstocks, only about one third proved resistant to *Pseudomonas mors-prunorum*.

Raspberry. A number of selections from crosses of American black with red raspberries combine good fruit quality with outstanding firmness. Crosses have now been made to combine these qualities with spinelessness and aphid resistance. The general programme of breeding for resistance to aphid (*Amphorophora rubi*) continued. A number of crosses were made between inbred parents as a first step in the production of commercial varieties. Hybrids of raspberry with *Rubus arcticus*, *R. glaucus*, *R. mesogaeus* and *R. cockburniana* were grown.

Ribes. Tetraploid black currant x gooseberry hybrids which were crossed with diploid and tetraploid black currant have flowered sparsely. A survey was made of resistance to gooseberry sawfly (*Nematus ribesii*) in *Ribes* species and hybrids and cultivated forms.

A number of hybrids from B21 (tetraploid black currant x gooseberry) x tetraploid gooseberry were grown; these proved to be spineless except for some soft spines at the base of young seedlings. Triploid hybrids from B21 x diploid gooseberry were also grown. In the selfing programme, twenty-one S_1s and ten S_2s were raised.

5271 *VI. Plant pathology.* (*pp. 24–30*).

Of 67 clones of St. Julien of Orleans plum, 24 were highly resistant or immune to *Pseudomonas mors-prunorum*. Isolates of this bacterium differed in virulence but all were pathogenic. Streptomycin-resistant variants did not differ significantly in virulence from the original parental strains, indicating that streptomycin resistance and virulence are unrelated. Studies on the mechanism of resistance to

Verticillium in hops and other plants continued; the character most consistently correlated with high resistance was the early and complete suberization of the endodermis.

5272 *Talboys, P. W., Bennett, M. & Wilson, J. F. Tolerance to* Verticillium *wilt diseases in the strawberry.* (*pp. 94–99*).

V. albo-atrum was found to be more pathogenic to strawberries than the more prevalent *V. dahliae.* Talisman showed a high degree of tolerance to both species; Cambridge Premier, Cambridge Rearguard, Huxley and Royal Sovereign were moderately tolerant to *V. dahliae* but only slightly tolerant to *V. albo-atrum*; and both species induced severe symptoms in Cambridge Vigour.

Zusammenfassungen der Vorträge anlässlich des internationalen Symposiums über "Physiologische Probleme im Obstbau" in Dresden-Pillnitz. (**Summaries of lectures given at the international symposium on "Physiological Problems in Fruit Growing" at Dresden-Pillnitz**).
Dtsch. Gartenbau 1960 : **7** : 324–27.

5273 *Pieniazek, S. A. Die Arbeiten des Obstbauinstituts in Skierniewice auf dem Gebiet der Obstbaumphysiologie.* (*The work of the fruit-growing institute at Skierniewice in the field of fruit-tree physiology*). (*p. 325*).

Of several physiological and morphological methods of testing for frost resistance, the best was one involving the determination of artificial frost injuries to tissues by the measurement of electrolyte diffusion.

5274 *Schander, H. Variationsstudie über den Eintritt des Blühbeginns bei Apfelsämlingen.* (*Variation study on the beginning of flower initiation in apple seedlings*). (*p. 325*).

Although the duration of the nonreproductive phase is genetically determined, no correlations between this and other characters have been detected.

5275 *Stolle, G. Die Anwendung von Infrarot-Strahlen bei der Selektion winterharter Obstgehölze.* (*The utilization of infrared rays in the selection of winter-hardy fruit trees*). (*p. 326*).

Infrared irradiation of trees in the autumn prevents the development of hardiness, while irradiation in January breaks winter dormancy; both treatments thus provide improved conditions for selection for hardiness. Use of these methods has allowed genotypes with different temperature reaction norms to be distinguished. Treatment in December or January resulted in greater variation in time of flushing than later treatment and thus allowed different types to be separated more easily. The later the treatment, the shorter the period between treatment and flushing and the shorter the duration of the individual phases of flushing.

5276 Bernhard, R. & Remy, P.
Les arbres fruitiers. (**Fruit trees**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 173–84.

Breeding and selection objectives and methods, as applied to apple, pear, quince, apricot, peach, almond and cherry, are discussed in general terms. Mention is also made of the present position of breeding programmes in France.

5277 Frolov, A.
(**Valuable plants**).
Sel'sk. Hozjajstv. Tadžikistan. (Agric. Tajikistan) 1960 : No. 7 : 34–35 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G707 : p. 65. [Russian].

Krymskij 43 [Crimean 43] was the most productive fig variety and Kzyl-anor [Red pomegranate] the highest yielding pomegranate among varieties tested in Tajikistan.

5278 **Progress Report of the Horticulture Division, Central Experimental Farm, Ottawa 1954–58** : Pp. 178.

This report carries on from the previous one which covered the period 1949–53 [XXVI, 3668]. New varieties already referred to in *Plant Breeding Abstracts* are omitted from mention in the following abstract.

Apple. Selection 0–342 (Crimson Beauty x Melba) has been the best of the early-ripening selections made at Ottawa. It ripens shortly after Crimson Beauty, being equal in appearance to this parent but considerably better in quality.

Information is given on the ability of Cortland, Delicious, Haralson, Lawfam, Linda, Lobo, McIntosh, Melba, Niobe, Northern Spy, Sandow and Yellow Newton to transmit earliness and several fruit characters. Twelve scab-resistant seedlings showing promise are briefly described. Eleven were derived from Jonathan x 26829 [(Rome Beauty x *Malus floribunda*) sib] and the remaining selection from Red Melba x (Wolf River x *M. atrosanguinea* 804). The possibility of inducing mutation for scab resistance by treating seeds with X rays is being explored.

Undertaken with a view to developing a laboratory technique for evaluating hardiness in breeding, experiments on the electrolytic conductance of tissues are reported in detail [XXIX, 1905; XXXI, 2507].

Raspberry. S_1 progenies of Madawaska, Muskoka, Ottawa, Rideau, Trent and Tweed were studied, with the ultimate aim of developing superior parents. Assuming that observations on S_1s are valuable as an indication of genotypic value, Trent appeared to be the best parent, since its progeny possessed good vigour, a high degree of winter survival and the capacity to give high yields of bright attractive berries satisfactory in size. One S_1 seedling of Muskoka, seven of Trent and one of Tweed were chosen for further inbreeding. S_2 plants were markedly reduced in vigour and it was necessary to grow them for two years in flats so that they would attain sufficient size for field planting.

Blueberry. Crosses between high-bush varieties, as well as interspecific crosses of high-bush, were effected. In crosses of high-bush with native low-bush blueberry, the progenies were intermediate in plant and fruit type. The F_2s, obtained by sibbing, failed to yield segregates differing greatly from the F_1s. Back crosses gave plants which were in general intermediate between the F_1 and high-bush parent.

Wide, low-growing high-bush plants have been selected which may be more easily covered with snow for winter protection.

Elder. *Sambucus canadensis* has been crossed with *S. racemosa*, the F_1 being intermediate between the parents in characters of the flowers and foliage and in fruit colour. No viable seeds have so far been obtained from the hybrids.

Strawberry. S_2 selections of Premier, Sparkle and Fairfax were compared with the parent varieties with respect to combining ability, when crossed with a common tester (Valentine). The results suggested that certain of the inbreds could replace the original varieties as parents in breeding.

Cranberry. Crosses between Beaver [cf. XXVIII, 2667] and Early Black are being evaluated.

Cabbage. Screening of varieties for resistance to *Hylemyia brassicae*, followed by progeny testing of selected lines, provided some evidence of resistance within Jersey Wakefield, a variety with a small pointed head and without popularity among growers.

Sprouting broccoli. Self incompatibility [XXVIII, 2327] and persistent sepals [XXIX, 808] have been investigated genetically. Two mutants with pale green leaves each depended on a single recessive gene, respectively designated *pg*–1 and *pg*–2. The gene for glossy foliage (*gl*) segregated independently of *pg*–1, *pg*–2 and other genes.

Cucumber. Pickling and slicing types combining resistance to bacterial wilt (*Erwinia tracheiphila*), scab (*Cladosporium cucumerinum*) and cucumber mosaic virus are being developed. PI200818 offers a source of monogenic dominant resistance to wilt. Several commercial varieties carry a dominant gene for resistance to scab. In breeding the slicing type, Marketer is being used as the recurrent parent in back crossing Marketer x PI200818. Niagara is the recurrent parent in back crossing Highmoor (scab resistant) x Niagara (mosaic tolerant), scab-resistant, mosaic-tolerant lines being selected. It is expected that lines from the two series of back crosses will be combined so as to obtain selections resistant to all three diseases. Breeding with the pickling type has reached the third back cross of Wisconsin SMR12 (scab resistant, mosaic tolerant) x PI200818 with the former parent.

The possibility of using female-flowering types in producing disease-resistant F_1 hybrids is also being investigated.

Tomato. Using *Lycopersicon pimpinellifolium* 'X907W' and its derivatives as sources of resistance to race 0 of *Phytophthora infestans*, some progress has been made in breeding for resistance to this disease. Under very severe conditions of infection, it would however be necessary to provide at least some spray protection for resistant lines. Development of canning varieties earlier than Ferguson for eastern Ontario and southern Quebec and, in both canning and fresh-market tomatoes, improvement of fruit colour and resistance to blossom-end rot and to radial and concentric cracking are also receiving attention. Webb Special, possessing genes for a higher degree of pigmentation, is being used in breeding for intensified colour.

Egg plant. The possible value of the monogenic recessive male sterility found in Blackie for developing F_1 hybrids is being explored, so far with encouraging results [XXVI, 3668].

Pea. Investigations were carried out on the identification of physiological races of *Ascochyta pisi* [XXVIII, 2390] and the genetics of resistance to race II [XXIX, 3278].

Sweet corn. Progress was made in developing hybrids improved in earliness and other characters.

In 1957, early Ottawa-bred lines were crossed with Gaspé Flint, an open-pollinated yellow maize which has proved to be extremely early at Ottawa. In 1958, most ears on the F_1 hybrids were ready for table use 15 days before those of Seneca 60, the earliest commercial entry in the test. The material is to undergo selection for sugary kernels, combined with earliness, the aim being to develop an open-pollinated variety specifically adapted for domestic gardens in short-season areas.

5279 Fogle, H. W. & Barnard, E.
Punched cards as aids in evaluating seedlings in the field.
Fruit Var. hort. Dig. 1961 : **15** : 47–50.

Based on experience in evaluating fruit seedlings by machine analysis of field data in breeding at the Irrigation Branch Experiment Station, Prosser, Wash., a discussion is given of the advantages and disadvantages of using edge-notched, mark-sensing and portable punched cards.

5280 Mijdla, H.
(On the occasion of the 75th birthday of A. A. Kurvits).
Sadovodstvo (Horticulture) 1960 : No. 12 : p. 51. [Russian].

Mention is made of varieties of apple, pear, cherry, plum, currant and raspberry bred by Kurvits at Tartu. They combine frost resistance with high quality. Plum seedlings of Emma Lipperman and Wilhelmina Spät survived the severe winter of 1939–40.

5281 Martini, S.
Giorgio Gallesio, pomologist and precursor of Gregor Mendel.
Fruit Var. hort. Dig. 1961 : **15** : 53–54.

A short account is given of the pomological work and plant-breeding experiments of Gallesio (1772–1839).

5282 Linder, R.
Faktorielle Pollenletalität. **(Factorial pollen lethality).**
Z. VererbLehre 1961 : **92** : 1–7.

The occurrence of pollen abortion determined by the recessive *p* factors in apples, pears, grapes and *Oenothera* is reported.

5283 Łucka, M.
Wpływ różnych sposobów kastrowania kwaitów na tworzenie się zawiązków. **(Influence of different methods of emasculating flowers on the production of embryos).**
Zeszyt. nauk. wyższ. Szkoł. roln. Krakow. : Rolnictwo 1961 : **8** : No. 12 : 155–61.

In varieties of cherry, plum and apple emasculated by removal of (*a*) anthers, (*b*) stamens and (*c*) stamens, corolla and most of the calyx, and exposed to open pollination, fruit set after 11 or 15 days was generally similar in (*a*) flowers to that of nonemasculated controls, was very low in (*c*) flowers at the 15-day stage, although appreciably higher at the 11-day stage in cherry and plum, and was intermediate in (*b*) flowers. The final fruit set, resulting from effective fertilization, was generally similar to that of the controls in both (*a*) and (*b*) flowers and was usually zero in (*a*) flowers. It is concluded that method (*c*) discourages cross pollination by insects and might therefore be useful for artificial crossing without isolation, although set would probably still be low; methods (*a*) and (*b*) would require isolation.

5284 Fetisov, G. G. & Filimonova, G. A.
(The efficacy of artificial pollination of fruit trees with the use of different emasculation techniques).
Agrobiologija (Agrobiology) 1960 : No. 3 : p. 463. [Russian].

Experiments at Moscow on intervarietal pollination of pear, sour cherry and plum showed that the removal of anthers was preferable to the excision of the entire perianth.

5285 Nesterov, Ja. S.
(Preliminary selection of fruit-tree seedlings according to the length of the resting period).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 5 : 67–72. [Russian].

Studies on the relationship between the duration of the resting period and the winter hardiness of a number of species and varieties of apple, apricot, pear, plum and cherry were conducted at the Majkop Experimental Station and at the Mičurin Fruit and Vegetable Institute. The results indicated that, in general, seedlings with a long resting period are more winter hardy in areas where the winter season is likely to be interrupted by mild spells. In north and north-east Russia, where thaws do not generally occur in winter, seedlings with a short resting period are more winter hardy. Early selection for long dormancy may be effected on the basis of the following criteria: a long period of seed stratification; absence of branching in the first year's growth; and a late inception of growth in the second year.

5286 Eremeev, G. N.
(The problem of drought resistance in fruit trees).
Sadovodstvo (Horticulture) 1960 : No. 12 : 21–24. [Russian].

A method suitable for selection of drought-resistant forms of apple, pear, apricot, peach and walnut has been developed at Jalta. It is based on a ten-point rating of the degree of wilting of the leaves.

5287 Coleș, N.
Comportarea unor soiuri de măr în bazinul Ialomiţei. **(The behaviour of some apple varieties in the basin of the Ialomiţa).**
Grădina Via Livada 1960 : **9** : No. 11 : 38–42.

Data are provided on the fruit yield and quality of five varieties. Creţesc yields most but its quality is inferior.

5288 Usatyj, P. P.
(The problem of heterosis in hybrid apple seedlings).
Sborn. Trud. Aspirant. molod. nauč. Sotrud. Inst. Rastenievodstv. (Symp. Wk. post-grad. jun. sci. Wkr. Inst. Pl. Industr.), Leningr. 1960 : 223–27 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 29680 : p. 63. [Russian].

Heterosis in vegetative characters was observed in interspecific hybrids between apple cultivars and *Malus orientalis* at Majkop.

5289 **(The apple Renet Pisguda).**
Sadovodstvo (Horticulture) 1960 : No. 12 : p. 34. [Russian].

Renet Pisguda [Pisgud Reinette], which is common in the North Caucasus and the Ukraine, is drought resistant. The fruit is large and its flavour good.

5290 **[The apple Renet Moiseeva (Burchardt seedling 2)].**
Sadovodstvo (Horticulture) 1960 : No. 11 : p. 43. [Russian].

Renet Moiseeva [Moiseev Reinette] is a seedling selected from open-pollinated Burchardt's Reinette in Kazahstan. It is winter hardy and productive of high-quality fruits weighing 300–350 g. It ripens in October and keeps till May and shows improved resistance to mildew in comparison with its seed parent.

5291 Kuznecov, V. V. & Leplinskaja, A. A.
(New apple varieties for Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv. Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 35–41 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G656 : p. 63. [Russian].

Early varieties bred in Uzbekistan are described.

5292 Schwartze, C. D.
The Ohlson apple.
Fruit Var. hort. Dig. 1961 : **15** : 51–52.

Derived from a tree discovered in about 1935 by E. A. Ohlson, near Puyallup, Wash., the apple Ohlson has been released after trials at the Western Washington Experiment Station and elsewhere. It is notable for its unusually large fruits (4 in. or more in diameter), which are attractive in appearance and flavour and useful for both dessert and cooking purposes. The variety also has good tree characters and annual bearing habit. Its main defects are moderately coarse and soft flesh and low fruit weight. The chief promise of Ohlson may be for cultivation in domestic gardens, roadside markets and breeding.

5293 Jovančević, R. & Čardaklija, C.
Domaće sorte jabuka u Gornjem Polimlju. **(Local varieties of apple in Gornje Polimlje).**
Arh. poljopr. Nauk. 1960 : **13** : No. 42 : 95–115.

Detailed descriptions are given of 19 local varieties. The results of analyses of the acid, sugar and total solids content of each variety are provided.

5294 Mircea, C. I.
Studiul particularităţilor biomorfologice ale soiurilor de măr, cu privire specială la formarea coroanei. **(A study of the biomorphological characteristics of apple varieties, with special reference to the formation of the crown).**
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 309–24.

Branching habit and crown shape are described for some of the principal varieties grown in Rumania.

5295 Nesterov, Ja. S.
(Form development in vegetatively reproduced apple).
Agrobiologija (Agrobiology) 1960 : No. 2 : 294–96. [Russian].

Clonal variability in apple seedlings, ungrafted or grafted on different rootstocks, in respect of fruit characters is described.

5296 Popov, B. A.
(An interesting apple hybrid).
Agrobiologija (Agrobiology) 1960 : No. 1 : 147–48. [Russian].

A seedling of Doucin III from pollination with the pollen of another tree of Doucin III is remarkable for its capacity to form roots and the ease of vegetative reproduction.

5297 TUDOSESCU, O.
Soiurile locale de măr—portaltoi de perspectivă. (**Local apple varieties as promising rootstocks**).
Grădina Via Livada 1960 : **9** : No. 10 : 44–45.

An investigation of the value of Rumanian cultivars and wild apples and of their seedlings as rootstocks indicated that seedlings of the cultivars Creţesc and Sălciu are highly suitable for this purpose.

5298 MILLER, S. R., NELSON, S. H. & HEENEY, H. B.
Studies on apple rootstock selections relating respiration rates to an anatomical method of predicting dwarfness.
Canad. J. Pl. Sci. 1961 : **41** : 221–26.

The respiration rates of (1) leaf discs of clonal selections of *Malus baccata* and *M. robusta* and (2) the root tips of rooted softwood cuttings of these selections were related to the percentages of bark on adventitious roots, as determined in earlier investigations, which had shown that the last-mentioned measurement may serve as a criterion of dwarfing potential. The data indicated that the respiration rate of leaf discs or root tips would be a satisfactory measurement of dwarfing potential, instead of bark percentage, provided the selections tested comprised a closely related series. It is suggested that the most satisfactory procedure would be to restrict the studies, at any rate initially, to selections derived from controlled crosses between parents differing in dwarfing ability.

5299 MIŠIĆ, P. D.
Dinamika cvetanja raznih sorti jabuka. (**The dynamics of flowering in various apple varieties**).
Arh. poljopr. Nauk. 1960 : **13** : No. 42 : 12–34.

The flowering habits of 231 varieties were studied at the Institute of Fruit Growing, Čačak. Data are provided on flowering period, relative profusion of flowers, date of petal fall and fertility. The varieties are classified into early, mid-early, mid-late, and late-flowering groups. The mid-late varieties were characterized by minimum profusion of flowers combined with maximum fertility. Early-flowering varieties such as Šarlamovski, and varieties with a brief flowering period, such as Weisser Klarapfel [White Transparent Apple], were most frequently subjected to late frosts. It is recommended that early-flowering varieties ripening in the early summer (e.g. Šarlamovski) be crossed with later lines in order to develop new summer varieties ripening earlier than those grown at present. Late-flowering types such as London Pippin would, it is suggested, be valuable material for the development of high-quality productive varieties suitable for areas where late frosts are frequent.

5300 GRUPPE, W.
Über den Ertragswechsel verschiedener Apfelsorten. (**Variation of yield in different apple varieties**).
Gartenbauwiss. 1960 : **25** : 33–45.

Observations on 11 varieties are reported; James Grieve was outstanding for its high yield and small variation. The importance of determining crop variation when judging varieties is emphasized.

5301 WILNER, J.
Relationship between certain methods and procedures of testing for winter injury of outdoor exposed shoots and roots of apple trees.
Canad. J. Pl. Sci. 1961 : **41** : 309–15.

Two-year-old trees of Northern Spy, McIntosh and Antonovka on *Malus robusta* rootstocks were kept in pots outdoors at the Plant Research Institute, Ottawa, during the winter of 1958–59, during which the lowest air and soil temperatures recorded were respectively — 26·0° and — 1·0° F. Comparable control trees were kept in a storage cellar at a constant temperature of 32 ± 3° F. With the outdoor treatment but not the indoor, a highly significant association was obtained for determinations of the conductance and resistance of diffused electrolytes, using roots and shoots. Highly significant interactions were found between (1) varieties and treatments (outdoor, indoor), (2) twig portions (terminal, median and basal) and treatments and (3) varieties and twig portions. Both methods are considered to be of value in selecting for hardiness in tree fruits exposed to natural outdoor freezing, the resistance method being preferable because it is much simpler. [Cf. XXXI, 2507].

5302 LAPINS, K.
Artificial freezing of 1-year-old shoots of apple varieties.
Canad. J. Pl. Sci. 1961 : **41** : 381–93.

One-year-old shoots of 35 varieties and 6 clonal rootstocks were exposed to artificial cold treatment in early winter, midwinter or late winter in three successive winters at the Summerland Research Station, BC. The rate of temperature drop was 0·7° C. per hour, a minimum temperature of — 37° ± 0·5° C. being maintained for

8 or 16 hours. The rise in temperature after freezing was not controlled. Damage caused by freezing was assessed by (1) evaluating discoloration of the tissues shortly after treatment, (2) estimating recovery subsequent to forcing for three weeks in the greenhouse and (3) measuring the electrical conductivity of water extracts from twig portions. Samples collected and frozen in early winter or midwinter gave comparable results in all three seasons, but those collected and frozen in late winter (February or early March) failed to yield reliable values. The recovery test, it is concluded, may be used to evaluate freezing injury, in conjunction with the conductivity method, which may reveal small differences in amount of injury not detectable by either of the other two methods. Discoloration ratings corresponded very closely to recovery ratings and may therefore be omitted. Conductiviy readings should be expressed as percentages of total electrolytes. The hardiness ratings for the 35 varieties studied, whose degree of frost resistance was in most cases already known, agreed closely with expectations. Where discrepancies occurred between the actual and expected results, they could usually be traced back to insufficient uniformity of the plant material available for freezing. Procedures found satisfactory in this investigation should prove successful in screening selections with unknown degrees of hardiness.

5303 Hristo, A. A.
(Dormancy and winter hardiness in apple under conditions of western Siberia).
Fiz. Rasten. (Phys. Pl.) 1961 : **8** : 58–66. [Russian].

The duration of dormancy, transformation of reserve substances, swelling of colloids and separation of the cell protoplasm were studied in different apple varieties and forms. The differences observed in the above respects in hardy forms such as *Malus pallasiana, M. prunifolia* or varieties derived from them and in the less hardy Mičurin and central Russian varieties are described.

5304 Lobanov, G. A.
(Some ontogenetic characteristics in hybrid pear seedlings).
Agrobiologija (Agrobiology) 1960 : No. 1 : 71–74. [Russian].

Variability of young seedlings from the same hybrid family in cultural characteristics is discussed in relation to selection. Morphological characters of the vegetative organs were positively correlated with fruit size, but no correlation was found between morphological characters and flavour, winter hardiness or quality.

5305 Šapirov, S. K.
(Variability in growth of buds of pear in connexion with their age).
Agrobiologija (Agrobiology) 1960 : No. 2 : 255–58. [Russian].

Recent pear hybrids proved more adapted to altered environment than established varieties when budded on identical stocks. In particular they grew better and formed crowns quicker in an arid district of Uzbekistan. Considerable variability in the above respects was observed between different buds taken from the same hybrid tree.

5306 Denisov, V. F.
[The inheritance of characters in pear hybrids (*Pyrus communis* L. x *P. regelii*)].
Bjull. centr. genet. Labor. Mičurin. (Bull. Mičurin centr. genet. Labor.) 1960 : No. 9–10 : 89–94 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G665 : p. 64. [Russian].

Hybrids of *Pyrus sylvestris* 'Doč' Blankovoj' [Blankova's Daughter] x *P. regelii* had leaves of two kinds: (1) resembling the pollen parent and (2) intermediate. Progeny from Russkaja Moldavka [Russian Moldavian] x Bessemjanka [Seedless] x *P. regelii* had some leaves resembling the pollen parent and some resembling the seed parent.

5307 Dragavcev, A. P.
(Pears in China).
Sadovodstvo (Horticulture) 1960 : No. 11 : 55–57. [Russian].

The principal varieties and forms belonging to different species found in China are described. The varieties grown for their fruit mostly pertain to *Pyrus serotina, P. bretschneideri* and *P. ussuriensis*, other species being used mainly as rootstocks. In breeding, *P. serotina* is of interest for disease resistance and the other two for winter hardiness; *P. ussuriensis* is hardier than *P. bretschneideri*.

5308 Pavlov, A. K.
(New pear varieties for Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 51–54 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G688 : p. 64. [Russian].

Varieties bred recently at Samarkand are described.

5309 Ésaulova, I. N.
(Biology of flowering and pollination in pear).
Agrobiologija (Agrobiology) 1960 : No. 2 : 268–70. [Russian].

All pear varieties studied at the Majkop branch of the Institute of Plant Industry were practically self sterile and required pollinators. Many varieties formed parthenocarpic fruits but their yield was greatly increased by outpollination. Not a single instance of apogamy was observed. Some varieties with highly viable pollen, which are suitable both as pollen and seed parents, are listed. Triploid varieties were unsatisfactory pollinators.

5310 Bezručenko, N. Z.
(The problem of heterophylly in pear, *Pyrus cummunis* L.).
Sborn. nauč.-issled. Rabot Azov-Černomorsk. sel'skohozjajstv. Inst. (Symp. sci. res. Wk. Azov-Black Sea agric. Inst.) 1958 (1959) : No. 16 : 155–59 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G664 : p. 64. [Russian].

Seedlings of *P. communis* in the Krasnodar region had many dissected leaves resembling those of *Crataegus*. As the seedlings grew older the number of dissected leaves decreased.

5311 Žavoronkov, P. A.
(Breeding winter-hardy pear varieties).
Sadovodstvo (Horticulture) 1960 : No. 11 : 28–31. [Russian].

Hybrids combining winter hardiness with pleasant flavour and fair size of fruit were obtained at Čeljabinsk by crossing *Pyrus ussuriensis* with south European varieties such as Lesnaja Krasavica [Forest Beauty] and Clapp's Favourite. Hybrids differing in maturation period are listed. In addition to the above, hybrids distinguished by great winter hardiness were obtained by crossing Limonovka, a hybrid of *P. ussuriensis* x *P. communis*, with Blagoveščensk, a selected form of *P. ussuriensis*. These hybrids have smaller fruit but their flavour is good and they are thought to be useful for immediate introduction and as breeding material.

5312 **(The quince Groševidnaja).**
Sadovodstvo (Horticulture) 1960 : No. 11 : p. 43. [Russian].

Gruševidnaja [Pear-shaped] is highly productive and resistant to fungous diseases. The fruit is of high quality and keeps and transports well.

5313 Masjukova, O. V.
(Productivity of quince varieties in Moldavia).
Sadovodstv. Vinogradarstv. Vinodel. Moldav. (Hort. Viticult. Wine-mak. Moldavia) 1960 : No. 3 : 18–19 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G689 : p. 64. [Russian].

Ten varieties with yields of up to 100 kg. per tree are listed.

5314 Kuznecov, V. V.
(The best local varieties of quince in Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 59–64 : from Ref. Ž (Ref. J.) 1961 : No. 2 : Abst. 2G690 : p. 64. [Russian].

Eight local varieties are described.

5315 Evreinoff, V. A.
Contribution à l'étude du cognassier. **(A contribution to the study of the quince).**
J. Agric. trop. Bot. appl. 1960 : **7** : 269–98.

Detailed information is provided on the origin, history, taxonomy, growth and development of *Cydonia oblonga*. Approximately 45 European, Asian and American varieties of the crop are described.

5316 Plock, H.
Die Geschichte und Entwicklung einer Marillensorte. **(The history and development of an apricot variety).**
Mitt. Klosterneuburg : Ser. B. 1960 : **10** : 125–30.

Mombacher Frühe [Mombach Early], which is cultivated in the region around Mainz, is said to be descended from trees introduced from France 200 years ago. Some of the forms of this apricot have valuable characters and three trees have been selected as a basis for building up new stock; one of these selections is particularly good in fruit and tree characters.

5317 Smykov, V. K.
(New apricot cultivars).
Sadovodstv. Vinogradarstv. Vinodel. Moldav. (Hort. Viticult. Wine-mak. Moldavia) 1960 : No. 3 : 15–16 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G698 : p. 64. [Russian].

Mention is made of two new winter-hardy varieties, one of them resistant to *Clasterosporium*.

5318 Kovalev, N. V.
(New apricot varieties selected at the Central Asiatic Branch of the Institute of Plant Industry).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 13–16 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst.. 3G747 : p. 69. [Russian].
Ten new varieties with improved resistance to spring frosts are listed.

5319 Vasilev, K. V. & Protasevič, L. A.
(New apricot varieties bred at the institute's Samarkand branch).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 5–11 : from Ref. Ž. (Ref. J.) 1961 . No. **2** : Abst. 2G699 : p. 64. [Russian]:
Eight new varieties are described.

5320 **Moongold and Sungold apricots.**
Fruit Var. hort. Dig. 1961 : **15** : p. 57.
Moongold and Sungold, both from Superb x Manchu, have been introduced by the University of Minnesota. They are hardy, vigorous, productive and disease resistant, ripening in late July or early August and producing medium-sized freestone fruits with good quality for dessert, jam, preserves and canning. Moongold ripens somewhat earlier than Sungold, its fruits having a "more sprightly" flavour, thicker and tougher skin and oblate shape in contrast to the longer fruit of Sungold.

5321 Kovalev, N. V.
Ameliorarea prunului în Uniunea Sovietică. **(Plum breeding in the Soviet Union).**
An. Romîno-Soviet. Ser.: Agric.-Zooteh. 1960 : **14** : No. 1 : 97–101.
Recent plum-breeding projects in the USSR are reviewed, with special reference to work involving interspecific hybridization.

5322 Reich, E.
Die zugelassenen Hauszwetschensorten. **(The approved domestic plum varieties).**
Dtsch. Gartenbau 1961 : **8** : 25–26, 72–74.
Details of fruit and tree characters, yield and frost resistance are given for the German local selections Ketzin, Werder, Stendal, Neundorf, Prethin, Greussen, Weimar and Bantzen. They are recommended for areas with conditions similar to those of the places of origin.

5323 Morettini, A.
Buone prospettive per il prugno e per il susino. I nuovi indirizzi sulle cultivar. **(Good prospects for the prune and for the plum . New directions in cultivars).**
Ital. agric. 1961 : **98** : 419–31.
Indications are given of some of the cultivars considered suitable for growing in Italy for the production of fresh fruit over as extensive a season as possible, and for producing dried prunes. Suitable pollinators are named.

5324 Kovalev, N. V.
(New plum and sweet-cherry cultivars for Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 27–33 : from Ref. Ž. (Ref. J.) 1961 : No. **2** : Abst. 2G696 : p. 64. [Russian].
Descriptions are given of 19 plum and 13 sweet cherry varieties bred at the central Asiatic branch of the Institute of Plant Industry. The plums include interspecific hybrids of *Prunus triflora* x *P. divaricata.*

5325 Korneev, V. A. & Korneev, P. V.
(Breeding new plum varieties for the Lower Povolž'e).
Trud. stalingr. sel'skohozjajstv. opyt. Stanc. (Res. Staling. agric. res. Stat.) 1952–1956 (1960) : No. **1** : 104–14 : from Ref. Ž (Ref. J.) 1961 : No. **4** : Abst. 4G680 : p. 65. [Russian].
Mention is made of winter-hardy, early and productive varieties bred in the province of Stalingrad. Most of them are crosses of large-fruited damson with southern plum varieties.

5326 Zwintzscher, M.
Kirschenzüchtung. Eine historische Übersicht. **(Cherry breeding. An historical survey).**
Gartenbauwiss. 1960 : **25** : 151–61.
The origin and development of cherry varieties in Europe and America are described.

5327 KURSAKOV, G. A. & KURSAKOVA, L. E.
(The results of varietal studies on sour cherry in 1959).
Bjull. centr. genet. Labor. Mičurin. (Bull. Mičurin centr. genet. Labor.) 1960 : No. 9–10 : 107–10 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G673 : p. 65. [Russian].

Two hybrids of sour cherry from Mičurinsk are described. A clone of Krasa Severa Pozdnjaja [Late Northern Beauty] has been selected. It is hardier and ripens later than the initial variety but is not quite as productive.

5328 ŁUCKA, M.
Oznaczenie stadium dojrzałości słupka u czereśni. **(Determination of the maturity stage of the pistil in the cherry).**
Zeszyt. nauk. wyższ. Szkoł. roln. Krakow. : Rolnictwo 1961 : **8** : No. 12 : 149–54.

Emasculation and artificial pollination were effected at four stages, from the closed bud D through D–E and E to the open flower F. Stigma receptivity and pollen germination began at stage E and increased at stage F.

5329 WILLING, H.
Phänologische und chemische Untersuchungen zur Fruchtentwicklung bei Kirschen. **(Phenological and chemical investigations on fruit development in cherries).**
Arch. Gartenb. 1960 : **8** : 561–94.

Observations on 14 varieties on 2 rootstocks are reported. The sweet varieties varied little in respect of the time when flowering commenced; the semisour and sour varieties flowered later, the latest being the Morello cherry. The total period of flowering varied between 12 and 16 days, some varieties being more variable in this character than others. Early-flowering varieties had a total flowering period about two days shorter than that of the late-flowering cherries. There was little difference between varieties in the length of the main flowering period. Varieties differed in the length of the period of fruit growth and in the course of fruit development; there were also differences in the periods of fruit colouring and full ripeness.

5330 CEREVATENKO, A. S.
(The best peach cultivars for Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 17–22 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G701 : p. 64. [Russian].

Five new varieties bred in Uzbekistan are described.

5331 KOVALEV, N. V. & ŠREDER, A. R.
(New peach varieties for northern districts of Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk. (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan. Acad. agric. Sci.) 1960 : **24** : 23–26 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G702 : p. 64. [Russian].

Varieties bred at the central Asiatic branch of the Institute of Plant Industry are described. They are resistant to frost and diseases.

5332 BRADT, O. A. & FISHER, D. V.
Vedoka, a new peach for British Columbia.
Fruit Var. hort. Dig. 1961 : **15** : p. 42.

Introduced jointly by the Horticultural Experiment Station, Vineland Station, Ont., and Research Station, Summerland, BC, Vedoka (J. H. Hale x Vedette) is recommended for trial in British Columbia and other peach-growing areas where bacterial leaf spot is not a problem. Ripening at the same time as Valiant, it bears large, round, freestone fruits with firm flesh and an attractive red blush on a light yellow background. Its canning quality is good. The variety is only slightly below Veteran in the hardiness of its buds.

5333 TABUENCA, M. C.
Incompatibilidad entre patrón e injerto. IV. Comportamiento del melocotonero con distintos patrones clonales del género *Prunus*. **(Incompatibility between stock and scion. IV. The behaviour of peach on different clonal rootstocks of the genus *Prunus*).**
An. Estac. exp. Aula Dei 1960 : **6** : 173–80.

Ackermann, Brompton (*Prunus domestica*), four lines of *P. insititia*, and a peach-almond hybrid were found to be compatible rootstocks with two peach varieties, Precoz de Hale [Early Hale] and Duraznilla de Sástago . When Mirobolán B (*P. cerasifera*) and, to a lesser extent, Mariana (*P. cerasifera* x *P. munsoniana*) were used as rootstocks, various symptoms of incompatibility were observed.

5334 ZORIN, F. M.
(What is new in breeding citrus fruits).
Priroda (Nature), Leningrad 1961 : No. 5 : 43–49. [Russian].

Breeding citrus fruits and the methods employed at Soči are discussed. The results include three mandarins which in recent trials outyielded all other varieties. The most productive was Soči 23, a nucellar seedling of Unshu [= Satsuma] mandarin. Černomorskij 320 [Black Sea 320] was 10–12 days earlier than all the other varieties and more resistant to frost than Unshu and Soči 23.

5335 SOOST, R. K. & CAMERON, J. W.
Contrasting effects of acid and non-acid pummelos on the acidity of hybrid citrus progenies.
Hilgardia 1961 : **30** : 351–57.

Among the pomelos used in breeding at the University of California Citrus Experiment Station, Riverside, Acc. 2240 is extremely low in acid content, even at the earliest sampling dates. Pomelo 2240 was crossed as ♀ with the following medium-acid varieties: Kara mandarin, Dweet tangor, Trovita orange, Kao Pan pomelo and the hybrid mandarins Frua and Kinnow. The progenies have been consistent in possessing low to medium average acid contents early in the season. In each progeny, some hybrids have been lower in acid than the medium-acid parent, although none of those tested was as low as pomelo 2240. Crosses of the first four of the above-mentioned medium-acid ♂ parents with the acid pomelos Pink, Karn Lau Yau, Deep Red and Siamese were also studied. Even at later sampling dates, the progenies had high average acid contents, the ranges in acidity being mainly above the contents of the respective ♂ and ♀ parents. Contents of total soluble solids were as high in progenies involving pomelo 2240 in their parentage as in those derived from the acid pomelos. Solids : acid ratios were therefore much higher in the progenies of pomelo 2240. It is suggested that other low-acid citrus varieties might be used in a similar manner to this accession, to develop early-ripening hybrids with favourable soluble solids : acid ratios early in the season.

5336 HAWTHORNE, P. L., BROWN, R. T., JONES, L. G., NEWSOME, D. W. & MILLER, J. C.
Plaquemines, a new seedless orange.
Circ. La. agric. Exp. Sta. 1960 : No. 67 : unpaginated.

Plaquemines originated as a seedless bud sport of Pineapple, a variety having 13–23 seeds per fruit. Ripening in January and early February, it is recommended for domestic planting along the lower Gulf Coast of Louisiana or in areas where other varieties of round sweet oranges do not suffer from winter killing.

5337 MAMPORIJA, F. D.
(Reproduction of the type of a vegetative hybrid by its seed generation).
Agrobiologija (Agrobiology) 1960 : No. 1 : 114–19. [Russian].

A morphological description is given of a tetraploid graft hybrid of Unshu (= Satsuma) mandarin/*Poncirus trifoliata* which gave rise to a nonsegregating sexual progeny identical with the mother plant. The vegetative hybrids and the seedlings had 36 chromosomes, while each component of the initial graft had 18 chromosomes. Mention is made of similar vegetative hybrids that are diploids. Mičurinist views on vegetative hybridization, burdos and chimeras are recapitulated.

5338 **(The mandarin Gruzinskij).**
Sadovodstvo (Horticulture) 1960 : No. 12 : p. 34. [Russian].

Gruzinskij [Georgian] is more resistant to cold than other mandarins grown along the Black Sea littoral. It produces parthenocarpic fruit with juicy flesh and a strong aroma. The variety comprises a range of forms, differing in the morphological characteristics of the leaves, fruits and spines.

5339 CAMERON, J. W. & SOOST, R. K.
Chandler - an early-ripening hybrid pummelo derived from a low-acid parent.
Hilgardia 1961 : **30** : 359–64.

Chandler was developed from a cross between the pomelo introductions Acc. 2240 and Kao Pan [cf. 5335]. At Riverside, Calif., it ripens in December, nearly two months earlier than most of the established older varieties. The hybrid has a medium content of soluble solids and a medium to slightly low percentage of acid; throughout each season the solids : acid ratios have exceeded 11 : 1. The flattened-globose fruits are medium in size, with a smooth to grained pale-yellow rind of medium thickness. The flesh is pale yellow, with varying amounts of pink coloration in the membranes of the segments and juice vesicles.

5340 Ivanovskaja, T. L.
(Fruit-bearing lemon seedlings under Moscow conditions).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 120–30. [Russian].

Details are given of the morphological features, chemical composition, maturation period and other characteristics of four seedlings, 1, 2, 4 and 27, developed at the Institute of Genetics.

5341 Rios C., D.
Clave para la identificación de ocho variedades de limón. **(A key for the identification of eight lemon varieties).**
Rev. Fac. nac. Agron., Colombia 1960 : **20** : No. 55 : 59–94.

The varieties Meyer, Variegado [Variegated], Génova, Perrine, Bonnie Brae, Rugoso [Wrinkled], Mexicano and Nativo are described in detail. The last two varieties were found to be very similar and it is suggested that they may be genetically identical.

5342 Motovilov, B. A.
(An experiment on growing fig in Krasnodar).
Subtrop. Kul't. (Subtrop. Cult.) 1959 : No. 2 : 58–63 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G668 : p. 64. [Russian].

Fig varieties grown successfully under screens and requiring no pollinators at Krasnodar are listed. They include the local variety Fioletovyj [Mauve], which is early and highly productive.

5343 Hakimov, H.
(Utilizing the method of vegetative hybridization in combination with sexual hybridization in breeding).
Dokl. Akad. Nauk Uzbek SSR (Proc. Acad. Sci. Uzbek SSR) 1959 : No. 7 : 42–44 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G274 : p. 28. [Russian].

Hybrids of mulberry obtained by vegetative and sexual hybridization differed morphologically from sexual hybrids between the same components. The former were characterized by heterotic vigour.

5344 Das, B. C.
Polyembryony in mulberry.
Curr. Sci. 1961 : **30** : p. 203.

Twin seedlings emerged from one of the seeds obtained from a cross between *Morus indica* var. *laciniata* and *M. alba* at the Central Sericultural Research Station, Berhampore, West Bengal.

5345 **(The persimmon Hačia).**
Sadovodstvo (Horticulture) 1960 : No. 11 : p. 43. [Russian].

The above variety has large fruits rich in sugar. They ripen in October-November, keep and transport well and yield a high-quality dried product.

5346 Životinskaja, S. M.
(Cultivation of oriental persimmon).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 117–19 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G792 : p. 72. [Russian].

Descriptions are given of 3 Uzbek standards and the new variety Pioner Uzbekistana [Uzbekistan Pioneer], which was bred at the South Uzbek Research Station of Subtropical Plants.

5347 Ten'kovceva, Ė. S.
(Choosing pollinators for the standard varieties of oriental persimmon).
Subtrop. Kul't. (Subtrop. Cult.) 1959 : No. 2 : 53–57 : from Ref. Ž. (Ref. J.) 1961 : No. 4 : Abst. 4G694 : p. 66. [Russian].

A few varieties which produce a large amount of pollen and give high percentage sets with most varieties are listed. They include two universal pollinators.

5348 Tarutani, T. & Manabe, M.
(Studies on the utilization of kaki fruits. II. On canned dried kaki).
Kagawa Daigaku Nogakubu Gakujutsu Hokoku/Tech. Bull. Fac. Agric. Kagawa Univ. 1959 : **11** : 259–64. [Japanese].

The suitability of 18 varieties for the above purpose was investigated, data being obtained on fruit weight, shape and ease of peeling, and consistency and colour of the flesh.

5349 Samarina, A. P.
(Biological characteristics of fertilization in subtropical persimmon).
Agrobiologija (Agrobiology) 1960 : No. 1 : 144–46. [Russian].

Self fertility, cross fertility and parthenocarpy of varieties grown in the subtropical parts of Russia are discussed in relation to yield, fruit quality, including variability in flesh colour, and systematics. The defects of classification systems by (1) sweetness of fruit and (2) constancy or variability of flesh colour are noted and a revised system is put forward. This envisages three groups of varieties; (1) those with tannins in the unripe fruits, (2) those with immature fruits free from tannins and (3) those with fruits showing variability in flesh colour. Parthenocarpic fruits of the last-mentioned forms have a different flesh colour and an inferior flavour to fruits obtained by pollination.

5350 Kalmykov, S. S.
(The best cultivated walnut varieties in the Bostandyk district).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 23–26 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G738 : p. 67. [Russian].

Four cultivars and eight selections from local wild trees are listed. The cultivars include a hybrid of the Pioner [Pioneer] walnut x pecan.

5351 Kuznecov, V. V. & Šreder, A. G.
(Pecan varieties for Taškent province).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 101–03 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G739 : p. 67. [Russian].

Three recent selections are described.

5352 Grente, J.
Influence de la lumière sur l'expression de la résistance chez les cultures de tissus de châtaignier. **(Influence of light on the expression of resistance in chestnut tissue cultures).**
CR Acad. Sci., Paris 1961 : **252** : 2441–42.

Studies on the effect of different light treatments on the resistance of *Castanea crenata* x *C. sativa* 'M15' cambial cultures to *Phytophthora cinnamomi* are reported. Cultures kept in continuous light or continuous darkness were more susceptible to artificial inoculation than cultures which had grown in continuous darkness for 20–30 days followed by an equal period in continuous light.

5353 **(The hazel Kudrjavčik).**
Sadovodstvo (Horticulture) 1960: No. 11 : p. 43. [Russian].

Kudrjavčik [Curly] is a common Abhazian variety distinguished by earliness and high yield. It is resistant to insects.

5354 Kalmykov, S. S.
(The best cultivated varieties of almond in the Bostandyk district).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 97–99 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G740 : p. 67. [Russian].

Descriptions are given of eight hybrids from the Bostandyk research station.

5355 Katayama, Y. & Nagatomo, T.
(A comparative study of differences in fruit setting and habit in groundnuts).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1960 : **29** : 167–68. [Japanese].

A study of 34 varieties is reported, data being presented on habit, seed size and number, and numbers of gynophores and mature pods.

5356 Bernard, R. L.
The breeding behavior and interrelationships of some pod and seed traits of peanuts.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3718 : 1028–29. (Abst.).

The following were studied in the F_1–F_4 of 19 crosses: (1) seed yield per plot, (2) number of pods per plot, (3) percentage of immature seeds, (4) percentage of three-segmented pods, (5) percentage of two-segmented pods, (6) number of seeds per 100 segments, (7) weight per seed, (8) percentage of diseased pods, (9) shelling percentage (weight of shells per plot) and (10) infection score for leaf spot (*Mycosphaerella arachidicola*). All ten measurements appeared to have sufficient genetic variability for appreciable changes to be possible through selection. Except for (4) and (5), all characters showed some relationship with yield. Measurements (3), (7), (9) and (10) were more heritable than (1). According to estimates of genetic and environmental variances and covariances, selection for individual traits would result in substantial increases in predicted yield advance in many cases, but selection for an index including yield and any one or all of the other characters would not lead to improvement over selection for yield alone. Measurements (3), (7) and (10) are considered to be of possible value in selection, instead of yield testing; (7) and (8) may also be worthy of further consideration in this connexion.

5357 D'Cruz, R. & Chakravarty, K.
Spontaneous allopolyploidy in *Arachis.*
Indian Oilseeds J. 1961 : **5** : No. 1 : 55–57.

A. villosa ($2n = 20$) was crossed with *A. hypogaea* ($2n = 40$) 'Spanish Improved' and 'White-seeded'. A single F_1 hybrid ($2n = 30$) was secured from each combination. Each hybrid yielded one seed, from which an allopolyploid ($2n = 60$) was obtained. The allopolyploid derived from the cross with Spanish Improved is termed plant 1, and that from the other cross plant 2. The allopolyploids were perennial, with a spreading habit, large leaves and flowers, short calyx tube and normal fertility. Like *A. villosa,* they were resistant to *Cercospora* leaf spot. The following chromosome associations were observed at metaphase I: Spanish Improved, $19{\cdot}76_{\mathrm{II}} + 0{\cdot}12_{\mathrm{IV}}$; White-seeded, $19{\cdot}50_{\mathrm{II}} + 0{\cdot}25_{\mathrm{IV}}$; *A. villosa,* 10_{II}; Spanish Improved x *A. villosa,* $14{\cdot}64_{\mathrm{I}} + 7{\cdot}44_{\mathrm{II}} + 0{\cdot}12_{\mathrm{IV}}$; White-seeded x *A. villosa,* $18{\cdot}00_{\mathrm{I}} + 5{\cdot}70_{\mathrm{II}} + 0{\cdot}15_{\mathrm{IV}}$; plant 1, $0{\cdot}20_{\mathrm{I}} + 25{\cdot}90_{\mathrm{II}} + 2{\cdot}00_{\mathrm{IV}}$; plant 2, $28{\cdot}08_{\mathrm{II}} + 0{\cdot}96_{\mathrm{IV}}$. The number of chromosomes passing to each pole at anaphase I ranged from 11 to 19 in the hybrids and from 25 to 35 in the allopolyploids. The possible significance of the quadrivalent frequencies in *A. hypogaea,* the hybrids and allopolyploids is discussed. It is suggested that formation of restitution nuclei in the megaspore mother cells or somatic chromosome doubling in the hybrid ovules was probably responsible for the origin of the allopolyploids.

5358 Smartt, J.
Groundnut varieties of Northern Rhodesia and their classification.
Emp. J. exp. Agric. 1961 : **29** : No. 114 : 153–58.

A collection of Northern Rhodesian varieties is described, on the basis of observations at the Central Agricultural Research Station, Mount Makulu. It has been possible to classify most forms according to Bunting's system [XXVI, 2796 and XXVIII, 4666]. Additional groups have been added, extending the recorded range of homologous variation within and between the principal subdivisions of the species. These groups, all comprising runner types, are as follows: Large Kongwa Runner, with two russet-brown kernels per pod and larger pods than those of Kongwa Runner; four testa-colour variants in the two-kernelled series; and four groups having characteristically more than two kernels per pod. The investigations have shown that the sequentially branched section and runner forms in the alternately branched section have similar ranges of testa colour, although it is not known why colours other than russet brown are so much less in evidence among the runner types. More intensive search may be expected to produce a similar range of variation in the spreading bunch forms in the alternately branched section. An attempt to transfer genes for pigmentation between the sequentially and alternately branched forms would be of considerable interest. At present, the origin of the unusually pigmented runner varieties in Northern Rhodesia may only be guessed at. They may have entered the country with the early importations, or have arisen in Central Africa by mutation or hybridization.

5359 D'Cruz, R. & Tankasale, M. P.
A note on chromosome complement of four groundnut varieties.
Indian Oilseeds J. 1961 : **5** : No. 1 : 58–59.

The four varieties studied, viz. Spanish Improved, White-flowered, White-seeded and Local, at the Poona College of Agriculture, differed in the total length of their chromosome complements, Local having the greatest length and Spanish Improved the least. Each variety possessed 38 median and 2 submedian chromosomes, and also one pair with a secondary constriction. The varieties showed, however, some differences within the median and submedian categories with respect to the numbers of chromosomes falling into different classes for exact centromere position. The evolutionary significance of these observations is briefly considered.

5360 Patil, S. H. & Bora, K. C.
Meiotic abnormalities induced by X-rays in *Arachis hypogaea.*
Indian J. Genet. 1961 : **21** : 59–74.

Meiotic irregularities in two X_1 plants of Spanish Improved from seed treated with 75,000 r. included reciprocal translocations, inversions, abnormal spindles, irregular chromosome separation, and partial or complete failure of cytocinesis. The occurrence of multiple spindles was noted.

5361 Lakshmana Char, M. S.
A preliminary note on the heritability of yield in the coconut.
Indian Cocon. J. 1959 : **12** : 65–68.

In studies on experimental lines at Kasaragod, India, estimates of heritability, based on (1) parent-progeny correlations and regressions and (2) correlations between years over a 10-year period, were 49% and 62% respectively.

5362 SAKAI, K.-I.
(Studies on the breeding of the coconut).
Tamagawa Daigaku Nogyobu Kenkyu Hokoku/Bull. Fac. Agric. Tamagawa Univ. 1960 : No. 1 : 63–71. [Japanese].

Two selection indices (I), based on the heritabilities and genetic correlations of yield of copra in pounds (C), nut number (N), weight of husked nuts in pounds/plant/year (W), and number of months from transplantation to first anthesis (F) in two Ceylonese populations, A and B, are calculated. These are: $I_{(\mathrm{A})} = \mathrm{C} — 1{\cdot}0734N — 38{\cdot}3803W — 0{\cdot}2320F$; and $I_{(\mathrm{B})} = \mathrm{C} —0{\cdot}7903N — 48{\cdot}7284W — 0{\cdot}2650F$. It is thought that mass selection based on these indices would give better results than the paired-cross method recommended by Harland [XXVIII, 4673].

5363 TAŠMATOV, L. T.
(Jujube).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 113–15 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G794 : p. 72. [Russian].

Varieties selected for large fruit and other useful characters at this institute are listed. They include a hybrid of Krupnoplodnyj [Large-fruited] with a local variety, and Melkoplodnyj [Small-fruited], whose seedlings make useful rootstocks for the large-fruited varieties.

5364 LOGINYČEVA, A. G.
(The results of raspberry varietal trials in Kirov province).
Sadovodstvo (Horticulture) 1960 : No. 12 : 14–16. [Russian].

Many winter-hardy varieties with high yields, including the 1959 standards Marlborough, Novost' Kuz'mina [Kuz'min's Novelty] and Usanka [Moustache] were tested. The first two are distinguished by earliness and high quality; Usanka is a self-fertile midseason variety.

5365 JOHANSSON, E.
Sortförsök med hallon 1953–1960.
(Varietal trials of raspberries, 1953–1960).
Medd. Trädgårdsförs. 1961 : No. 135 : Pp. 20.

Information on disease incidence, hardiness, vigour and yield is given for a total of 19 varieties tested at nine localities in Sweden.

5366 HULL, J. W.
Commercial red raspberries in Arkansas ?
Arkans. Fm. Res. 1961 : **10** : No. 1 : p. 10.

Colchicine-doubled hybrids involving *Rubus parvifolius* in their parentage and derivatives of these polyploids have shown resistance to *Septoria* leaf spot, heat, drought and fluctuating winter temperatures. The new types range from semitrailing to fully erect in habit, depending on the number of back crosses to American varieties of red raspberry. Most of the selections bear large attractive fruits which are notably firm even when fully ripe and have given especially good results when canned.

5367 BRIGGS, J. B.
Three new strains of *Amphorophora rubi* (Kalt.) on cultivated raspberries in England.
Bull. ent. Res. 1959 : **50** : 81–87.

Work at East Malling, England, has provided evidence of the existence of three new strains of *A. rubi* differing in their ability to breed on a series of varieties including Malling Promise, P1, Chief, Baumforth A and derivatives of each of the two last. Designated European raspberry strains 1, 2 and 3, they appear to differ from both the North American strain and the *Rubus caesius* strain.

5368 MEL'NIKOVA, V. A.
(Preliminary results of varietal testing of fruit trees and soft fruits).
Sadovodstvo (Horticulture) 1960 : No. 12 : 12–13. [Russian].

Five winter-hardy varieties of black currant and three of gooseberry outyielding the respective Baškirian standard varieties are listed. The black currants include Gornaja [Montane], which was bred at the Baškirian research station. The gooseberry varieties are resistant to *Sphaerotheca*.

5369 MOČALOVA, T. I.
(Currant varieties from Krasnojarsk).
Sadovodstvo (Horticulture) 1960 : No. 12 : 27–29. [Russian].

Five black-currant varieties bred from wild local material found in the Lena valley are described. They are all winter hardy and highly productive. Some produce large dessert fruit, others, including Nadežnaja [Reliable] which is resistant to pests and diseases, are suitable for processing.

5370 Rymaševskij, V. K. & Rymaševskaja, R. S.
(The importance of nectar production of different varieties of fruit trees and soft fruits).
Agrobiologija (Agrobiology) 1960 : No. 1 : p. 143. [Russian].

Observations at Mičurinsk indicated that apple, black currant and gooseberry varieties with sweet nectar were more attractive to bees than varieties having nectar with a lower sugar content. Some varieties produced more nectar than others but the amount of nectar available did not alter the selective preference of bees for sweet nectar. Data on nectar production, sugar content of nectar and counts of bees alighting on a plant are provided, for a few varieties of black currant and gooseberry.

5371 Zaharov, G. A.
(The effect of supplementary pollination with foreign pollen upon improvement of productiveness in the black currant).
Agrobiologija (Agrobiology) 1960 : No. 3 : 461–62. [Russian].

The efficacy of the following methods of pollination was studied with several varieties at Mičurinsk: (1) open pollination; (2) fertilization by the pollen of other plants of the same variety; (3) controlled self pollination; (4) supplementary pollination with the pollen of gooseberry or sour cherry; and (5) pollination by the best black-currant pollinators. Judged by set and berry weight, the best method was (1), followed by (5) and (4).

5372 **Woodard is for the deep South.**
Agric. Res., Wash. 1961 : **9** : No. 9 : 15–16.

Developed by the Georgia Coastal Plain Experiment Station, Tifton, Woodard is the only rabbit-eye variety, besides Tifblue, which makes blueberry production in the deep South of the USA a good commercial proposition. Its berries are light blue, tangerine-shaped and larger than those of other rabbit-eye varieties, with good transportability and slightly more acid flavour than Tifblue. For high yields, Woodard requires to be pollinated by another rabbit-eye variety and it should therefore be grown with Tifblue.

5373 Hall, I. V. & Aalders, L. E.
Cytotaxonomy of lowbush blueberries in eastern Canada.
Amer. J. Bot. 1961 : **48** : 199–201.

Clones collected from nine localities were classified as follows: *Vaccinium myrtilloides* ($2n = 24$); *V. brittonii* ($2n = 48$); hybrids between *V. corymbosum* and *V. angustifolium*; hybrids ($2n = 48$) between *V. angustifolium* and *V. myrtilloides*, assumed to have involved unreduced gametes of *V. myrtilloides* in their origin; *V. angustifolium*, $2n = 48$; and a new diploid species, *V. boreale* ($2n = 24$). *V. angustifolium*, the common low-bush blueberry in commercial cultivation in eastern Canada, and *V. boreale* may be distinguished on the basis of corolla length, pollen size and degree of branching, in addition to chromosome number. Most other characters of the two species overlap with varying environmental conditions and their use for taxonomic purposes has thus led to confusion. *V. boreale* is found typically on exposed headlands in Newfoundland and has not been seen in commercial fields outside that province.

5374 Trofimov, T.
(*Hippophae* at the Botanic Garden of Moscow University)..
Sadovodstvo (Horticulture) 1960 : No. 12 : 32–33. [Russian].

Breeding *Hippophae*, using forms collected on Soviet territory or introduced from Switzerland, is reported. Mention is made of large-fruited hybrids with sweet fruit obtained from a cross between Russian and Siberian ecotypes.

5375 Gatin, Ž. I.
(Reproducing selected forms of *Hippophae*).
Sadovodstvo (Horticulture) 1960 : No. 12 : 29–32. [Russian].

Vegetative reproduction of varieties bred from wild Siberian forms at the Altaj Horticultural Research Station is discussed and some of the selections are described. They are winter hardy and highly productive of fruit rich in oil, vitamins and sugar and suitable for processing. Seedlings B27 and B29 have large sweet fruit which may be eaten fresh. Another large-fruited selection is spineless.

5376 Thomas, J. L.
The cytology of some cultivated species of *Viburnum*.
J. Arnold Arbor. 1961 : **42** : 157–64.

A survey is given of $2n$ numbers in *Viburnum*, based on counts by the author and other workers. It is postulated that the basic number of the genus is $x = 9$, species with $x = 8$ or 10 having arisen through loss or gain of a chromosome. Of the 50 species for which counts are available, 12 have $x = 8$, 33 have $x = 9$ and only two undisputed counts of $x = 10$. The three remaining species have been reported by some workers as having $x = 10$ and by others $x = 9$. According to the author's observations, chromosome aberrations were fairly common in several species. Unequal divisions were noted, as well as bridges, indicating translocations. Attention is drawn to the role of such aberrations in increasing opportunity for loss or gain of chromosomes.

5377 ISLAM, A. S.
Seedless strawberry.
Pakist. J. biol. agric. Sci. 1958 : **1** : 166–67.

Of the 106 F_1 hybrids ($2n = 35$) obtained at the Department of Botany and Plant Breeding, Sind University, Hyderabad, from *Fragaria vesca* ($2n = 14$) ♀ x *F. grandiflora* ($2n = 56$) ♂, three produced parthenocarpic fruits. Crosses in the reciprocal direction failed.

5378 IL'INSKIJ, A. A.
(Training strawberry seedlings and clones on different soil media).
Agrobiologija (Agrobiology) 1960 : No. 2 : 243–50. [Russian].

Observations are made on environmentally induced variability in morphological and economic characters of hybrid seedlings and clonal derivatives at Krasnodar. The same environment sometimes exerted different effects on seedlings and clones, but in both cases the changes were heritable. Generally speaking a deficiency or excess of nutrients impaired the value of breeding material while sandy soil promoted the development of early forms possessing good flavour.

5379 FALCH, J. & STRAUSS, E.
Beiträge zur Rentabilitätssteigerung im Erdbeeranbau. **(Contributions to increasing profitability in strawberry cultivation).**
Mitt. Klosterneuburg : Ser. B. 1960 : **10** : 131–41.

Regina, Macherauchs Früherente [Macherauch's Early Harvest], Senga Sengana and the new variety Jubilae from Klosterneuburg have proved productive in Austria. Jubilae, which is still undergoing trials, is vigorous and large fruited; it is hoped that it will be a suitable replacement for the now degenerated Madame Moutot. Jubilae ripens 5–6 days after Regina.

5380 JAGUDINA, S. I.
(New large-fruited varieties of strawberry for Uzbekistan).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk. (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 105–07 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G710 : p. 65. [Russian].

Three new intervarietal hybrids bred in Uzbekistan are described.

5381 TATAUROVA, A. S.
(New strawberry varieties selected at the Central Asiatic Branch of the Institute of Plant Industry).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 109–12 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G760 : p. 70. [Russian].

Four new varieties bred at this institute are described. One is a hybrid of Culver x Vlastelin [Potentate]; the others are open-pollinated hybrids of Late Leopoldshalle.

5382 DAUBENY, H. A.
Powdery mildew resistance in strawberry progenies.
Canad. J. Pl. Sci. 1961 : **41** : 239–43.

Seedlings of 20 crosses, comprising combinations between high-quality parents and red-core resistant ones, were rated at the Agassiz station, BC., for resistance to powdery mildew (*Sphaerotheca macularis*) in the greenhouse. Puget Beauty parentage, compared with Siletz, Surecrop, Talisman, Magoon or Stelemaster parentage, resulted in a highly significant increase in mean rating for resistance. British Sovereign parentage, as against Northwest or Agassiz parentage, led to a significant increase in the mean rating. Puget Beauty was the only parent giving relatively large numbers of seedlings immune or resistant. In the field, Siletz had been as resistant as Puget Beauty, but did not transmit this resistance to its progeny. Data from Puget Beauty crosses suggested that resistance depended on relatively few genes. Puget Beauty and resistant seedlings selected from crosses involving this variety will be used in breeding.

5383 Orchard, W. R. & van Adrichem, M. C. J.
Relative susceptibility of *Fragaria* spp. to the root-knot nematode *Meloidogyne hapla* Chitwood.
Plant Dis. Reptr. 1961 : **45** : p. 308.

Observations are reported on the susceptibility of *F. x ananassa* nm. *cuneifolia*, *F. chiloensis* ssp. *pacifica*, *F. moschata*, *F. nipponica*, *F. orientalis*, *F. vesca* sspp. *bracteata* and *vesca*, *F. virginiana* sspp. *glauca*, *platypetala* and *virginiana* and *F. viridis* to *M. hapla* in a greenhouse test. No egg masses were found on *F. virginiana* ssp. *platypetala*.

5384 **New cranberries.**
Amer. Fruit Gr. 1961 : **81** : No. 6 : p. 16.

Recently released by the US Department of Agriculture and Massachusetts Agricultural Experiment Station, Bergman, Franklin and Pilgrim are resistant to the leaf hopper (*Euscelis striatulus*) responsible for the spread of false-blossom virus.

5385 Page, O. T.
Variation in the banana-wilt pathogen, *Fusarium oxysporum* f. *cubense*.
Canad. J. Bot. 1961 : **39** : 545–57.

So-called clones, cultivars, varieties and groups of the above pathogen were inseparable on the basis of (1) cultural criteria previously used in their differentiation and (2) chromatographic assay of exogenous aminoacids, growth measurements and fusaric-acid production.

5386 Berežkovskij, E. A.
(**The maturation dates of different vine varieties in diverse climates**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 8 : 37–38. [Russian].

The effect on its growth period of transferring a variety to a different climate was studied, varietal differences being observed mainly in respect of the period of maturation of the berries. This period was short when a variety was grown in a climate approximating that of its place of origin. Warm spring shortened the period from bud opening to flowering in all varieties, but the period of flowering to maturation was a conservative varietal characteristic which was modified only in extremes of warmth or cold.

5387 Rives, M. & Boubals, D.
Les variétés de vigne. (**Vine varieties**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 185–90.

Breeding and selection methods suitable for the improvement of *Vitis vinifera* are discussed.

5388 Morkūnas, E.
Kai kurie duomenys apie vynuogių auginimą lauke Lietuvos TSR sąlygomis. (**Some data on vines grown in open ground in the Lithuanian SSR**).
Lietuvos TSR Mokslų Akad. Darb. 1960 : **21** : No. 1 : 87–111.

Madeleine Angevine, Early Pinot, Early Malingre and an unidentified variety from the Kaunas Botanic Garden were distinguished by earliness and grape quality in outdoor varietal trials and are recommended for direct introduction. Alpha, Ivanausko Rastinuke, Severnyj Sinij [Northern Blue] and Oberlin 604 were winter hardy and resistant to fungi and are regarded as valuable material for breeding new varieties for outdoor cultivation.

5389 Neagu, M. I. & Georgescu, M.
Contribuţii la studiul dezvoltării caracterelor şi însuşirilor in descendenţele hibride intraspecifice de viţă de vie. (**Contributions to the study of the development of characters and qualities in intraspecific hybrid descendants of the vine**).
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 345–63.

Detailed descriptions are given of numerous F_1 hybrids from (1) crosses between proles *pontica* and *occidentalis*, Negru vîrtos [Firm Black] x Cabernet Sauvignon, Negru vîrtos x Gamay noir [Black Gamay], Negru vîrtos x mixed pollen, Braghină x St. Emilion, Braghină x Pinot gris [Grey Pinot], Braghină x Italian Riesling, Braghină x Aligoté and Braghină x mixed pollen, and (2) crosses within proles *pontica*, Negru vîrtos x Negru moale [Soft Black], Braghină x Tămîioasă romînească [Rumanian Muscat] and Braghină x Gordan. The most promising hybrids were from the crosses between proles *pontica* and *occidentalis*.

5390 Neagu, M., Georgescu, M. & Stoica, V.
Hibrizi de perspectivă la viţa de vie. (**Promising vine hybrids**).
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 365–72.

Short descriptions, with special attention paid to sugar content of the berry, alcohol content of the wine and acidity, are given of 28 hybrids, mainly derived from the crosses listed in the preceding paper [5389].

5391 Almeida, J. L. F. de
Novas castas de videiras. **(New vine cultivars).**
Agricultura, Lisboa 1960 : No. 7 : 14–17.

Among a great number of hybrids produced in Portugal, some are distinguished by large berries with firm flesh, some are seedless and some have a muscat flavour; others have grapes with high sugar content, good colour and suitable acidity for wine making. The crosses that have given the best hybrids, both for dessert and for wine, are named. Some of the best existing vines have been improved by clonal selection.

5392 Dimitrov, P., Ivanov, J., Katerov, K. & Dimitrov, I.
(Some results from the breeding of new grape varieties for wine making).
Nauč. Trud. naučn.-izsled. Inst. Lozarstv. Vinarstv. (Sci. Trans. sci.-res. Inst. Viticult. Wine-mak.), Pleven 1959 : **2** : 191–209 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 2 : Abst. 388 : 106–07. [Bulgarian]. (Mimeographed).

Six good hybrids were obtained from the cross Traminer x Syrrah. They are medium early and have dark blue fruit which has a thick waxy skin and is not subject to splitting or rotting. In the size and weight of the fruit, the hybrids surpass Traminer but not Syrrah. A dark red table wine with well balanced flavour has been produced from the two best hybrids.

5393 Ivanov, J.
(Controlled nutrition of the ovules and the seed and embryo developing in them in the vine).
Nauč. Trud. naučn.-izsled. Inst. Lozarstv. Vinarstv. (Sci. Trans. sci.-res. Inst. Viticult. Wine-mak.), Pleven 1959 : **2** : 211–25 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 2 : Abst. 389 : 107–08. [Bulgarian]. (Mimeographed).

Vegetative rapprochement of the summer shoots of the rootstock to those of the scion variety resulted in the production of seedlings resembling those of the rootstock.

5394 Ajvazjan, P. K. & Dokučaeva, E. N.
(Krasavica Ukrainy, a new dessert grape variety).
Sadovodstv. Vinogradarstv. Vinodel. Moldav. (Hort. Viticult. Wine-mak. Moldavia) 1960 : No. 1 : 37–39 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G768 : 70–71. [Russian].

Krasavica Ukrainy [Ukrainian Beauty] (Karaburnu x Mat'jaš Janoš), which surpasses both parents in grape quality, is described.

5395 Nedelčev, N., Kondarev, M. & Zankov, Z.
[The hybrid Perle de Csaba x Ferganer schwarz 2 (III-3), (hybrid Červen septemvrijski)].
Lozarstvo i Vinarstvo (Viticulture & Wine-making) 1960 : **9** : No. 2 : 17–22 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 3 : Abst. 632 : p. 54. [Bulgarian]. (Mimeographed).

Červen septemvrijski [Red September] is a new dessert variety of grape. The dark blue fruit ripens in early August; it has a firm skin and is better able to withstand transporting than Perle de Csaba. The vine is strong and adapted to hilly districts.

5396 Smirnov, K. V.
(New vine varieties bred at the Samarkand branch of the Uzbek Scientific Research Institute for Horticulture and Viticulture).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 73–75 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G726 : p. 66. [Russian].

Four recent hybrids are described.

5397 Romanov, I. I.
(A new vine variety for making red wines).
Sadovodstv. Vinogradarstv. Vinodel. Moldav. (Hort. Viticult. Wine-mak. Moldavia) 1960 : No. 1 : 34–37 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G769 : p. 71. [Russian].

A description is given of Pervomajskij [1 May], which was bred at the Central Asiatic Branch of the Institute of Plant Industry. In recent Moldavian trials it yielded 125 c. per ha. under rainfed conditions.

5398 Tabanali, A. H.
(Rare local varieties of vine in the foothill zone of the Surhan-Dar'ja province of the Uzbek SSR).
Vinodelie Vinogradarstvo SSSR (Wine-mak. & Vitic. USSR) 1960 : No. 8 : 35–36. [Russian].

Descriptions are given of 11 varieties found in the above region which are recommended for introduction. They comprise wine varieties, early dessert vines and varieties grown for dessert or for drying.

5399 KROCHMAL, A. & NAWABI, A. A.
A descriptive study of the grapes of Afghanistan.
Vitis 1961 : **2** : 241–56.

The fruit characteristics of 48 varieties are listed.

5400 ŽURAVEL', M. S.
(**New vine varieties selected at the Central Asiatic Branch of the Institute of Plant Industry**).
Trud. nauč.-issled. Inst. Sadovodstv., Vinogradarstv. Vinodel. uzbekistan. Akad. sel'skohozjajstv. Nauk (Proc. sci.-res. Inst. Hort. Viticult. Wine-mak. Uzbekistan Acad. agric. Sci.) 1960 : **24** : 65–72 : from Ref. Ž. (Ref. J.) 1961 : No. **3** : Abst. 3G770 : p. 71. [Russian].

Thirteen varieties bred at this institute are described.

5401 KARANOVIĆ, V.
Stanje, problemi i perspektive proizvodnje stonog grožda u Bugarskoj. (**The present state, problems and prospects of production of dessert vines in Bulgaria**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 647–53.

Breeding and selection of dessert varieties in Bulgaria are discussed and the principal varieties, differing in maturation date, are listed. A few hybrids and clones, all derived from Afus-Ali (= Bolgar [Bulgarian]), are described.

5402 ZANKOV, Z.
(**A seedless hybrid Slavjanka [Bikane x Sultanina (24–3)]**).
Lozarstvo i Vinarstvo (Viticulture & Wine-making) 1960 : **9** : No. **4** : 27–33 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. **4** : Abst. 859 : p. 66. [Bulgarian]. (Mimeographed).

This variety has medium-sized oval berries with brittle greenish yellow skin which does not turn pink on ripening. Slavjanka ripens 4–6 days earlier than Sultanina and is more productive.

5403 **New grape released for home production in Florida.**
Sunshine St. agric. Res. Rep. 1960 : **5** : No. **2** : p. 15.

STOVER, L. H.
Blue Lake a new bunch grape for Florida Home Gardens.
Circ. Univ. Fla. agric. Exp. Sta. 1960 : No. S–120 : Pp. 10.

Developed at the Watermelon and Grape Investigations Laboratory, Leesburg, Fla., the dessert type Blue Lake, derived from Florida 43–47 (open-pollinated selection of *Vitis smalliana*) x Caco [Catawba (*V. labrusca* x *V. vinifera*) x Concord (*V. labrusca*)], is resistant to Pierce's disease.

5404 VATSALA, P.
Chromosome studies in Ampelidaceae.
Cellule 1961 : **61** : 191–206.

Cytological studies on seven varieties of *Vitis vinifera* revealed that only Anabishahi possesses a pair of satellite-bearing chromosomes. No other intervarietal chromosomal differences were observed. The following $2n$ numbers are reported: *Cissus trilobata*, 24; *Cayratia pedata*, 80; *Leea sambucina*, 22. Factors contributing to speciation in the Ampelidaceae are discussed.

5405 ENIN, T. K.
Obţinerea ramurilor poliploide de viţă de vie. (**Obtaining polyploid branches in the vine**).
An. Romîno-Soviet. Ser. Agric.-Zooteh. 1960 : **14** : No. **2** : 100–03.

[Cf. XXX, 3185].

5406 GOLODRIGA, P. JA.
(**Sex determination in vine plants by some biochemical indicators**).
Agrobiologija (Agrobiology) 1960 : No. **3** : 402–05. [Russian].

Most varieties with female flowers had a higher peroxidase and polyphenoloxidase activity and a higher ascorbic acid content than varieties with perfect flowers in studies conducted at the Magarač Institute in Jalta.

5407 GEORGESCU, M. I.
Variaţia diurnă a fotosintezei la cîteva soiuri de viţă de vie din colecţia Institutului Agronomic "N. Bălcescu" Bucureşti. (**Diurnal variation in the photosynthesis of some vine varieties in the collection of the N. Balescu Agronomic Institute, Bucureşti**).
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 397–408.

The diurnal and seasonal variation in photosynthetic rate of the varieties Aligoté, Italian Riesling and Tămîioasă romînească [Rumanian Muscat] is described.

5408 SINGH, S. N.
Germination of grape (*Vitis vinifera* L.) hybrid seeds by chilling.
Curr. Sci. 1961 : **30** : p. 62.

Satisfactory germination percentages were obtained when hybrid seed was stored at 40° F. for three months before sowing.

5409 GEORGIEVA, R. & IVANOV, I.
(The influence of the position of the inflorescence on the fertilization and viability of the seed and seedlings obtained).
Nauč. Trud. naučn.-izsled. Inst. Lozarstv. Vinarstv. (Sci. Trans. sci.-res. Inst. Viticult. Wine-mak.), Pleven 1959 : **2** : 227–49 : from Zbl. bulg. wiss. Lit. 1960 : **5,** No. 2 : Abst. 350 : p. 79. [Bulgarian]. (Mimeographed).

Investigations of six vine varieties showed that after open, self and cross pollination, fruit and seed set were better in the inflorescences of lateral shoots than in those of summer shoots; also the seed from the lateral shoots had a greater germination capacity and the seedlings grew more rapidly. It is suggested that the inflorescences of lateral shoots be used for hybridization experiments.

5410 GEISLER, G.
Untersuchungen zum Pfropfeinfluss auf die Transpiration im Zusammenhange mit der Unterlagenzüchtung bei Reben. **(Investigations on the influence of grafting on transpiration in relation to rootstock breeding in vines).**
Züchter 1961 : **31** : 8–14.

The intensity of transpiration relative to surface area was increased by grafting even when the scion was grafted on to a rootstock of the same type, provided there was an adequate supply of water. Differences in transpiration were noted between the various graft combinations studied. Under dry conditions, grafted vines transpired less intensely than corresponding vines on their own roots. It is thought that rootstocks should be selected with root systems capable of taking up a good supply of water to compensate for the increased loss of water on grafting.

5411 DVORNIC, V.
Observaţii asupra germinării polenului de la cîteva soiuri de viţă roditoare (*Vitis vinifera*). **[Observations on the germination of the pollen of some varieties of vine (*V. vinifera*)].**
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 387–96.

The optimum conditions for pollen germination of most of the varieties studied were 12–14% sucrose agar and 25–26° C. It was noted, however, that the pollen of Afuz-Ali would germinate over a considerable range in sucrose concentration, and that the pollen of Galbenă de Odobeşti [Odobeşti Yellow], Italian Riesling and Csaba Pearl would germinate at temperatures as low as 11–12° C. Information is provided on the percentage germination of 26 varieties.

5412 LEPĂDATU, V.
Dinamica diferenţierii mugurilor de rod la viţa de vie în funcţie de soi. **(The dynamics of the differentiation of the fruit buds of the vine as a function of variety).**
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 409–22.

A comparative study of the development of the inflorescence in the three varieties Aligoté, Crîmpoşie and Kiş-miş alb [White Sultana] is presented.

5413 HUGLIN, P.
Causes déterminant les altérations de la floraison de la vigne. **(The causes of defective flowering in the vine).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B. 1960 : **10** : 351–58.

Defective flower formation, the shedding of flowers and fruits associated with functionally unisexual flowers and shedding resulting from physiological disorders are discussed.

5414 DRAWERT, F.
Über Anthocyane in Trauben, Mosten und Weinen. Methoden zur Anreicherung und Trennung der Farbkomponenten. **(Anthocyanins in grapes, musts and wines. Methods for the accumulation and separation of the colour components).**
Vitis 1961 : **2** : 288–304.

Methods of separating anthocyanins by paper chromatography are discussed. *V. vinifera* wines have been found to differ considerably from hybrid wines in the composition of their red colouring matter.

5415 REICHARDT, A.
Experimentelle Untersuchungen über das Spätfrostverhalten früher Entwicklungsstadien der Weinrebe. **(Experimental investigations on the reaction to late frost of early stages of development of the grape vine).**
Züchter 1961 : **31** : 14–22.

Young shoots were tested in a cold chamber under various conditions of temperature and humidity; varietal differences in susceptibility to frost at the same stage of development were observed. The seedling S3951 showed relatively good resistance, although neither of its parents, Müller-Thurgau and Gewürztraminer, are resistant to late frost. The resistance of S9351 shoots was related to a high mass-surface area ratio. The more resistant varieties also had a higher content of soluble dry matter.

5416 Zotov, V. V.
(Raising *Phylloxera*-resistant élites of European vine varieties).
Sadovodstv. Vinogradarstv. Vinodel. Moldav. (Hort. Viticult. Wine-mak. Moldavia) 1960 : No. 1 : 32–34 : Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G776 : p. 71. [Russian].

Methods of selecting resistant plants under conditions of infection with *Phylloxera* are discussed.

5417 Alleweldt, G.
(The effect of length of day on growth of different vine varieties).
Agrobiologija (Agrobiology) 1960 : No. 1 : 57–62. [Russian].

[Cf. 916].

FOREST TREES

5418 Bouvarel, P.
Les semences forestières. (**Forest-tree seeds**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 191–98.

Considerations taken into account in forest-tree breeding, and methods adopted for improvement programmes in France, are discussed.

5419 Svensk skogsträdsförädling 1960. (**Swedish forest tree breeding, 1960**).
Forën. SkogstrFör. Årsbok 1960 : Pp. 52.

Populus. Segregation in the second and third generations of hybrid aspen is under study.

Alder. Crosses between *Alnus incana* and *A. glutinosa* are being compared with the parental species. The crosses *A. incana* x *A. glutinosa*, *A. incana* x *A. hirsuta*, *A. glutinosa* x *A. hirsuta* and 2*n* *A. glutinosa* x 4*n* *A. glutinosa* were effected in 1960.

Pine. Seed for progeny tests of 120 cross combinations has been obtained. Tests of different isolating materials have shown that, on the basis of number of full seeds per cone, white fabric and celluloid tubes are best and are little affected by aspect, while pergamin and plastic of different colours gave good results on the north side of the trees but were less good in a position facing the sun. In tests conducted in 1957, pollen from 1954, 1955 and 1956 stored in a desiccator at 10° C. gave a fairly constant seed set; the percentage of full seeds was 95% for fresh pollen, 70% for pollen from 1956, 50% for pollen from 1955 and 5% for pollen from 1954. In a trial of grafted pines on clay soil increases of 320–524% in cone production have been obtained by harrowing as against leaving the ground untreated.

Spruce. Hybrids among Continental trees and between Continental and Swedish trees are under study. In studies of 29 3-year-old hybrid progenies from Continental x Swedish spruce, no difference in specific gravity of the wood could be found between the hybrids and pure Swedish spruce. A correlation of $r = +0{\cdot}54$ was obtained between the specific gravity of the progenies and that of the paternal trees.

Larch. Interspecific crosses have been carried out.

5420 Heick, F.
Årsberetning 1960–61. (**Annual report, 1960–61**).
Hedeselsk. Tidsskr., Aarhus 1961 : **82** : 129–70.

The work of the Danish Heath Society has included the establishment of further seed orchards of Japanese larch, Douglas fir, Norway spruce, Sitka spruce, *Pinus murrayana* and *P. contorta*, based mainly on phenotypically selected plus trees. Progeny tests have also begun. A provenance trial of *P. contorta* has been set up.

5421 Goddard, R. E. & Brown, C. L.
An examination of seed orchard concepts.
J. For. 1961 : **59** : 252–56.

The authors point out that clonal seed orchards do not constitute the only avenue for the mass production of genetically improved forest planting stock, and suggest the use of seedling progeny from controlled crosses as an alternative. The relative advantages and disadvantages of both systems are discussed, with particular reference to a tree-improvement programme initiated by the Texas Forest Service in 1959.

5422 Dietrichson, J.
Sydlige proveniensers brukbarhet i Norge. (**The usefulness of southern provenances in Norway**).
Norsk Skogbruk 1961 : No. 6 : 229–31.

This is a report of a paper read during the Norwegian Agricultural Week, 1961. Trials of pines from Norway, Sweden, Finland, central Europe and Scotland, established in 1940 at Matrand in eastern Norway, have shown that northern races require less total warmth per year for the completion of annual growth than southern races, and that central European races from east of longitude 20° E. require less than western races. The lower heat requirement leads to earlier cessation of growth and thus to greater hardiness. Similarly, results from international spruce trials indicate that east European races are generally the most vigorous and are sufficiently hardy for Sweden and Finland. It appears, however, that the heat requirements of such races are not always met by conditions at Matrand. It is noted that at Matrand southern pines show lower summer wood production than those of more northerly provenance and are thus less strong and more susceptible to snow damage. However, a 50-year-old spruce stand in northern Norway, originating from eastern Norway, shows little or no summer wood production but does not appear to have suffered any injury.

5423 Sydlige proveniensers brukbarhet. (**The usefulness of southern provenances**).
Norsk Skogbruk 1961 : No. 7 : 260–61.

In the discussion following the presentation of the above paper, M. Haugberg reported that international spruce trials in England and France confirmed Dietrichson's results. The need for testing imported seed under various climatic conditions was stressed.

5424 ANDRONOV, N. M.
(**Some data on heritable transmission of acquired characters. From experiments on acclimatization of forest trees**).
Trud. Leningr. lesoteh. Akad. (Proc. Leningr. for.-tech. Acad.) 1959 : No. 90 : 57–60 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3A233 : p. 25. [Russian].

Various species of forest trees acquired greater winter hardiness with age at Leningrad. The progeny of some of these trees was even hardier than the seed parent.

5425 TUCKER, J. M.
Studies in the *Quercus undulata* complex. I. A preliminary statement. Amer. J. Bot. 1961 : **48** : 202–08.

On the basis of field observations and preliminary study of population samples, it is suggested that the *Q. undulata* complex in the southwestern region of the USA has arisen through hybridization of *Q. gambelii*, in different parts of its range, with one or another of the following species: *Q. arizonica*, *Q. turbinella*, *Q. havadrii*, *Q. muehlenbergii*, *Q. mohriana* and *Q. grisea*. The extent to which each of the last six species contributes to the complex and the area in which this contribution occurs are discussed.

5426 TUCKER, J. M., COTTAM, W. P. & DROBNICK, R.
Studies in the *Quercus undulata* complex. II. The contribution of *Quercus turbinella*.
Amer. J. Bot. 1961 : **48** : 329–39.

The hybridity of putative hybrids between *Q. gambelii* and *Q. turbinella* [cf. 5425] has been established by a demonstration of their morphological intermediacy. Of the binomials which have been applied to forms in the *Q. undulata* complex, *Q. pauciloba* clearly applies to the hybrids under consideration. The appropriate change in status to *Q.* x *pauciloba* is therefore made.

5427 VAARTAJA, O.
Demonstration of photoperiodic ecotypes in *Liriodendron* and *Quercus*.
Canad. J. Bot. 1961 : **39** : 649–54.

The author adds *L. tulipifera* and *Q. macrocarpa* to the array of tree species in which he has found the occurrence of photoperiodic ecotypes [cf. XXIX, 4478]. Seedlings of *Q. macrocarpa* from Manitoba (51° N.) and from Nebraska (41° N.) showed a significant, although not considerable, interaction between seed source and photoperiodic response, short-day treatment causing more inhibition of growth in the former seedlings. This result is interpreted as evidence of photoperiodic ecotypes in this species, although the onset of dormancy was controlled mainly by the endogenous growth rhythm.

5428 RODIN, A. A., IVANNIKOV, S. P. & ŽURAVLEV, I. A.
(**Producing quick-growing forests**).
Les. Hoz. (Forestry) 1961 : No. 5 : 72–73. [Russian].

Among many *Populus* species and forms which have been tested at the Obojan' forest farm for rate of growth, winter hardiness and timber quality in recent years, several hybrids are satisfactory in the above respects and grow well in varied environments. Five hybrids which have been given varietal names are listed. Two of them, Kursk and Obojan', were bred in Kursk province.

5429 ESCHNER, A. R.
Observations on a hybrid poplar test planting in West Virginia.
For. Res. Notes NE For. Exp. Sta. 1960 : No. 111 : Pp. 4.

Of 50 hybrid clones tested, seven are recommended for planting in West Virginia; all seven have *Populus maximowiczii* as one parent. The largest single tree was one of clone NE50, which was obtained from *P. maximowiczii* x *P. berolinensis*.

5430 **(Experiments on growing poplars).**
Les. Hoz. (Forestry) 1961 : No. 3 : 29–34. [Russian].

Mention is made of the quick-growing and drought-resistant hybrid *Populus marilandica* which has been introduced into the North Caucausus from Rumania. Also mentioned are two interspecific hybrids whose bark appears to be less attractive to hares than that of other species and hybrids.

5431 SANTAMOUR, F. S. (JUN.).
The relation between anatomy and inherent growth potential of hybrid poplars.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–3539 : p. 718. (Abst.).

A study was made of 25 hybrid clones, representing 18 different parental combinations and exhibiting a wide range of vigour in test plantings in the north-eastern part of the USA. The following measurements were made in roots and stems of one-year-old trees raised from cuttings: (1) bark percentage (relative area of the root or stem cross-section occupied by bark), (2) fibre percentage in the bark, (3) percentage of vessel area in the wood, (4) vessel size and (5) percentage of medullary tissue in the wood. Calculation of (1) was made from caliper measurements, and of the remaining characters from microscopic sections by photographic techniques. Except for bark percentage in the stem, highly significant differences between clones were found for all measurements. Correlations between these measurements and six variables of growth were determined, the latter being estimated from replicated nine-year-old test plantings of the same clones at two centres. On the combined basis of interclonal differences in anatomical characters and the data on the correlations, bark percentage in the roots appeared to be the best single criterion for early selection for vigour, its relationship with growth being inverse. Fibre percentage in the root bark, positively associated with growth, was the only other measurement of possible value for this purpose. Study of five clones in replicated six and ten-year-old tests indicated that bark percentage of the root was a clonal characteristic. Analysis of a limited number of seedlings of *Populus deltoides* and of plants grown from cuttings of these seedlings revealed no significant differences in bark between seedling and adventitious roots. Selection for vigour by anatomical criteria may thus be applicable to woody plants not readily propagated by cuttings.

5432 OJAMAA, M. M.
(Biological form of aspen in the forests of southern Estonia).
Les. Hoz. (Forestry) 1961 : No. 2 : 11–13. [Russian].

Four Estonian biotypes differing in rate of growth and resistance to *Ganoderma* are described. Five-year-old and older trees are distinguishable by bark colour. The most valuable biotype has green bark, the others light, dark or grey bark.

5433 STERN, K.
Über den Erfolg einer über drei Generationen geführten Auslese auf frühes Blühen bei *Betula verrucosa*. **(On the success of three generations of selection for early flowering in *B. verrucosa*).**
Silv. genet. 1961 : **10** : 48–51.

From six early-flowering plants, selection for precocity gave many F_2 and about 70% F_3 plants which formed flower buds in the first year, sometimes without forming vegetative buds, and flowered in the second. Most catkins were male or androgynous and showed good pollen fertility, while female catkins and the female parts of the androgynous catkins were poor in fertility. The vegetative characters were those of juvenile rather than mature plants.

5434 RICHENS, R. H.
Studies on *Ulmus*. IV. The village elms of Huntingdonshire and a new method for exploring taxonomic discontinuity.
Forestry 1961 : **34** : 47–64.

A biometrical study of the leaves of 102 samples is reported. Most of the samples could be assigned to three closely related and one more remote group of *U. carpinifolia*. Sporadic samples of *U. procera* and putative hybrids of *U. carpinifolia* x *U. glabra* and *U. carpinifolia* x *U. procera* were also found. The most frequently occurring type of *U. carpinifolia* is thought to be of Roman introduction, Godmanchester being a likely centre of distribution. Most of the *U. procera* in this area appears to date back no further than the eighteenth century.

Some notes on the horticultural variety known as the Huntingdon Elm are included.

A method of treating taxonomic discontinuity quantitatively is described. [Cf. XXX, 3219].

5435 LAMB, F. B.
An approach to mahogany tree improvement.
Caribbean For. 1960 : **21** : 12–20.

The desirability of initiating a programme of mahogany improvement, based on genetical principles, is stressed. After reviewing information on the natural variation and geographical distribution of *Swietenia mahagoni*, *S. macrophylla* and *S. humilis* and on the probable evolutionary relationships between these species, the author suggests and discusses procedures of improvement. Ecotypes within the three species should first be identified and evaluated. Superior individual trees should then be selected within promising ecotypes, followed by clonal and progeny tests. Initial steps in these directions have already been taken in Puerto Rico. Before controlled pollination can be undertaken, it is necessary to ascertain the details of the reproductive process of the three species by cytological and phenological studies. Preliminary observation of the natural intermediate form believed to be a hybrid between *S. mahagoni* and *S. macrophylla* indicates the possibility of producing a type with the vigorous growth of the latter species and the desirable wood characteristics of the former. In view of possible difficulties in controlled cross pollination, due to floral structure, other means of producing and testing hybrids should be sought. Isolated mixed plantings of selected individuals of *S. mahagoni* and *S. macrophylla* have been established at Chetumal, Quintana Roo, Mexico. Similar plantings should be made in other areas, using ecotypes of the three species. Tests of natural intraspecific hybridization are also required.

5436 GIORDANO, E.
Osservazioni su alcuni ibridi di *Eucalyptus viminalis* x *E. globulus*. **(Observations on some hybrids of *Eucalyptus viminalis* x *E. globulus*).**
Pubbl. Centro Sperimentaz. agr. forest., Roma 1960 : **4** : 45–52.

Certain trees found in a plantation of *E. viminalis* in Rome differed from that species in certain features characteristic of *E. globosus*, trees of which were growing nearby, and are thought to be natural hybrids, similar to those previously referred to as *E.* x *antipolitensis* or *E. unialata*. The hybrid trees are vigorous and tolerant of relatively unfavourable conditions and are considered useful for planting in Italy.

5437 RUGGERI, C.
Primo contributo alla conoscenza cariologica del genere *Eucalyptus* (Myrtaceae). **[First contribution to the caryological study of the genus *Eucalyptus* (Myrtaceae)].**
Pubbl. Centro Sperimentaz. agr. forest., Roma 1960 : **4** : 121–26.

Studies of 13 species from different parts of Australia and Africa have shown them all to have $2n = 22$, no differences in morphology having been detected between the chromosomes of the different species.

5438 RUGGERI, C.
Secondo contributo alla conoscenza cariologica del genere *Eucalyptus* (Myrtaceae). **[Second contribution to the caryological study of the genus *Eucalyptus* (Myrtaceae)].**
Pubbl. Centro Sperimentaz. agr. forest., Roma 1960 : **4** : 139–50.

The results of studies of 10 further species [cf. 5437] from Australia and Africa are presented. The number $2n = 24$ was confirmed for *E. corynocalyx*; the remaining species had $2n = 22$, their caryograms being very similar to those of other species.

5439 RUGGERI, C.
Il numero cromosomico di *Eucalyptus flocktoniae* Maiden (Myrtaceae). **[Chromosome number in *E. flocktoniae* Maiden (Myrtaceae)].**
Pubbl. Centro Sperimentaz. agr. forest., Roma 1960 : **4** : 211–23.

A study of this Australian species has shown it to have the number $2n = 24$ like *E. corynocalyx* [cf. 5438] and *E. redunca*, both of which belong to the same area in southern Australia. Though their areas are not today contiguous they probably were in the Tertiary period or even more recently.

5440 RUGGERI, C.
Il numero cromosomico di *Eucalyptus* x *Trabutii* Vilmorin (Myrtaceae). **[Chromosome number in *Eucalyptus* x *Trabutii* Vilmorin (Myrtaceae)].**
Pubbl. Centro Sperimentaz. agr. forest., Roma 1960 : **4** : 41–44.

The species in question, a natural hybrid of *E. botryoides* x *E. camaldulensis*, was studied by Feulgen smears and found to have $2n = 22$, its caryogram being very similar to those of the two parent species.

5441 AL'BENSKIJ, A. V.
(Distant grafts in forest trees).
Agrobiologija (Agrobiology) 1960 : No. 3 : 396–401. [Russian].

Mention is made of seedlings raised from the stock of the graft-hybrids of *Fraxinus ornus/F. lanceolata* and *F. ornus/F. pennsylvanica* at Kamyšin. The seedlings had a higher rate of survival, grew taller and developed more vigorous root systems than seedlings of *F. lanceolata* and *F. pennsylvanica.*

The hybrids had a reduced transpiration rate and were tolerant of high temperatures.

5442 ORTMANN, C.
Vorläufige Untersuchungsergebnisse zur Frage der Selektionstypen für die Frühdiagnose von *Salix alba*-Populationen. **(Preliminary results of investigations on the question of selection types for the early diagnosis of *S. alba* populations).**
Silv. genet. 1961 : **10** : 43–48.

Among one-year-old seedlings, three types of root habit could be distinguished, viz. (1) tap roots, (2) intermediate and (3) branched roots. A year later, type 1 plants were appreciably taller than types 2 or 3 when grown at 10 x10 cm. but not when grown at 100 x 120 cm. Two-year-old plants selected in their first year for tap roots included a higher proportion of plants with a single erect main shoot and short or long lateral branches than those selected for habits 2 or 3. A good proportion of plants with a single erect main shoot and long lateral branches occurred among selections of type 3, which had been selected also for erectness of the stem in the first year; these selections were superior in growth to other type 3 plants. Selection in the first year may thus be useful in eliminating undesirable growth types.

5443 KHOSHOO, T. N.
Chromosome numbers in gymnosperms.
Silv. genet. 1961 : **10** : 1–9.

The chromosome numbers of 264 gymnosperm species as well as a number of hybrids are listed. The species belong to 55 genera representing all of the thirteen living families. Recent cytogenetic studies by the author and others are briefly reviewed and suggestions for future work are made.

5444 TOHYAMA [TOYAMA], T.
(The Pacific and Japanese-Sea races of *Cryptomeria japonica*).
Shimane Naka Daigaku Kenkyu Hokoku/Bull. Shimane agric. Coll. 1960 : No. 8A : 141–49. [Japanese].

The distinction between these two races, based on crown type, angle of leaf attachment and growth rate, is criticized as insufficiently established. However, a cline was found in respect of angle of leaf attachment, this angle increasing from north to south.

5445 DUFFIELD, J. W.
A simple device for weight-sorting seeds.
For. Sci. 1960 : **6** : p. 362.

A sorter, useful for genetical and physiological studies of conifer seedlings, is described. The apparatus is a modification of a glass fibre balance, described by Sax, to permit rapid weight sorting by the addition of magnetic damping and an unloading device which removes the seeds from the balance pan and deposits them in a container appropriate to their weight class.

5446 DURRIEU-VABRE, A.
Étude chromosomique de *Pseudolarix kaempferi* (Lindl.) Gord. [**A chromosomic study of *Ps. kaempferi* (Lindl.) Gord.**].
CR Acad. Sci., Paris 1961 : **252** : 773–75.

The diploid chromosome number of *Ps. kaempferi* is reported to be 24.

5447 **Cooperative Forest Genetics Research Program. Third Progress Report February, 1961.**
Res. Rep. Univ. Fla. School For. No. **5** : Pp. 14.

The above programme of the School of Forestry of the University of Florida is carried out in cooperation with pulp and paper companies having substantial plantations, the emphasis being upon investigations with slash pine (*Pinus elliottii*). Seed orchards of this species and loblolly pine (*P. taeda*) have been established. Controlled pollinations were effected with a view to testing mother trees for general combining ability. Plot-size trials are under way to obtain information relevant to progeny-testing procedure. Studies of inheritance in progress include crooked stem in loblolly pine, vigour in slash pine, and bole and crown characteristics in the latter species and sand pine (*P. clausa*).

5448 Perry, T. O.
The inheritance of crooked stem form in loblolly pine (*Pinus taeda* L.).
J. For. 1960 : **58** : 943–47.

A series of crosses between straight and crooked *P. taeda* trees were made at the University of Florida in 1954. An analysis of the progeny indicated that genetical influences played a major role in the determination of stem form, and that several genes were involved. The progenies obtained were too small for the determination of Mendelian ratios. None of the parent trees tested proved to be homozygous for either straight or crooked form. No significant correlation was found between crooked stem form and height of growth.

5449 Brown, C. L. & Goddard, R. E.
Silvical considerations in the selection of plus phenotypes.
J. For. 1961 : **59** : 420–26.

In this discussion, emphasis is placed on the necessity of using a selection system which reduces subjectivity to a minimum and which allows the elimination of phenotypes exhibiting superiority largely attributable to abnormal environmental advantages. The principles generally used in the evaluation of "plus phenotypes" of southern pine species are discussed. An essentially objective system of individual tree selection, based on a comparison of the relative growth efficiency of a given tree with that of the largest dominant trees on the same site, is proposed. Details are given of minimum requirements which the tree under study must possess before qualification as a "plus tree selection".

5450 Sax, K.
Meiosis in interspecific pine hybrids.
For. Sci. 1960 : **6** : 135–38.

Meiosis in F_1 hybrids of *Pinus griffithii* x *P. strobus*, *P. parviflora* x *P. strobus* and *P. holfordiana* x *P. parviflora* was about as regular as in the parent species. The hybrids were vigorous and their pollen fertility was relatively high. Although these Himalayan, Japanese and American species have been widely separated geographically for a very considerable period, the results suggest that they are closely similar in chromosome constitution and are genetically compatible.

5451 Vaartaja, O.
Ecotypic variation of photoperiodic response in tree seedlings during their second season.
Bi-m. Progr. Rep. Canad. Dep. For. 1961 : **17** : No. 2 : p. 2.

In earlier work on ecotypic variation in the photoperiodic response of tree species, the author used seedlings less than one season old [XXIX, 4478]. In the present note he describes evidence of photoperiodic ecotypes of *Pinus banksiana* and *Picea glauca*, as given by observations on seedlings during their second season.

5452 Guinier, P.
Trois conifères de la flore vosgienne. **(Three conifers of the Vosges flora).**
Bull. Soc. bot. Fr. 1959 : **106** : Sess. 85 : 168–83.

The origin and distribution of the populations of *Pinus sylvestris*, *P. montana* and *P. excelsa* occurring in the Vosges region are discussed.

5453 Namkoong, G.
Female flowers on one-year-old pitch pine.
For. Sci. 1960 : **6** : p. 163.

After drawing attention to the value of precocious flowering in forest trees to the geneticist, the author reports the production of ♀ flowers by three one-year-old potted seedlings of an intraspecific hybrid of *Pinus rigida* at the Southern Institute of Forest Genetics, Gulfport, Miss.

5454 Douglass, M. M.
Intraspecific variation in *Pinus flexilis*.
J. Colo.-Wyo. Acad. Sci. 1958 : **4** : 30–31.

From a study of the *flexilis*, *macrocarpa* and *reflexa* varieties of *P. flexilis*, it is concluded that these three forms are sufficiently distinct to warrant subspecific status. Concerning the relationship between *P. flexilis* and *P. ayacahuite*, it is reported that differences between contiguous subspecies or varieties of these two are very slight.

5455 Johnsson, H.
Kottskörd och fröutbyte från fröplantager av tall. **(Cone and seed yield in seed plantations of pine).**
Svenska SkogsvFören. Tidskr. 1961 : **59** : 1–21; also Årsberätt. För. Växtf. Skogstr. 1960 : Pp. 21.

Cone and seed yields were studied in 1959–60 in a total of 83 clones established during 1948–52 in plantations at four different stations in Sweden. Cone yield varied markedly according to clone and was closely related to the flower production of the clones. Other clonally specific characters were frequency of empty seeds, number of seeds per cone (although this depends also upon pollen availability) and 1000-seed weight. No rootstock influence upon cone or seed yield was detected.

5456 Callaham, R. Z. & Hasel, A. A.
***Pinus ponderosa*. Height growth of wind-pollinated progenies.**
Silv. genet. 1961 : **10** : 33–42.

Further investigations [cf. XXX, 3227] at the Institute of Forest Genetics, Placerville, Calif., showed that seed size, time required for germination, elevation of seed source and crop year of the seed all had a significant effect on the growth of the wind-pollinated progenies in their second year. Variations in height after 15 yr. however were correlated only with second-year performance and with elevation of seed source and its square. Equations were developed for predicting 15-year height from second-year performance and seed source elevation. The best of these accounts only for 49·2% of the variation in 15-year height; about 39% of the variation was attributable to heritable genetic differences between progenies.

5457 Kiellander, C. L.
Svensk gran och kontinentgran. (**Swedish spruce and continental spruce**).
Forën. SkogstrFör. Årsbok 1960 : 193–204.

This paper has already been abstracted from another source [2615].

5458 Kleinschmit, R.
Versuche mit Fichtenstecklingen für einen genetischen Test. (**Experiments with spruce cuttings for a genetical test**).
Silv. genet. 1961 : **10** : 10–20.

Cuttings from a total of 90 large (G), medium (M) and small (K) trees in a naturally regenerated stand were studied. K cuttings rooted more readily than M or G and responded less to treatment with growth substances. No difference in survival of cuttings was detected among groups. After five years, K cuttings were the tallest on the average and showed the greatest variation in height, while G cuttings were smallest and showed least variation. G mother trees showed the greatest late-frost damage and K the least. Correspondingly, a higher proportion of G than K cuttings were early flushing; but in each group the tallest cuttings were earliest to flush, so that the relatively poor growth of G cuttings could not be attributed to frost injury. Height of the five-year-old cuttings proved to be inversely related to age of the mother trees up to the age of about twenty years, when growth began to fall off; K mother trees had the lowest average age and G the highest. The proportions of cuttings which had changed from plagiotropic to orthotropic were 51% for K, 33% for M and 3% for G. The factors affecting these differences are considered, and the bearing of the results upon clonal tests for genetical studies is discussed.

5459 Melchior, G. H.
Versuche zur Förderung der Blühwilligkeit an japanischen Lärchen-Propflingen (*Larix leptolepis*). [**Experiments on increasing flower production in grafts of Japanese larch (*L. leptolepis*)**].
Silv. genet. 1961 : **10** : 20–27.

This is a fuller version of work already abstracted [cf. 3910].

VEGETABLES

Eleventh Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick 1960 (1961) :
Pp. viii + 72.

5460 *Haigh, J. C. Plant breeding report. (pp. 14–18).*

Spring cabbage. Further progress was made in selecting inbreds of commercial varieties for earliness and resistance to bolting.

Cauliflower. In breeding for resistance to whiptail on molybdenum-deficient soil, wild cabbage, which has shown no symptoms, was crossed with a highly susceptible early summer cauliflower, Cambridge 6. The hybrids were almost free from the disorder. Attempts to produce F_2 hybrids have so far failed but back crosses to cauliflower have been produced.

Brussels sprouts. Initial tests of a method of producing hybrid seed on a commercial scale gave encouraging results. Pollination was effected by insects in nylon cages in the field, the parents being sterile or sib-incompatible inbred lines. Some of the hybrids from seed produced in this way gave considerably improved yields of marketable sprouts over Cambridge Special or Cambridge 1.

Lettuce. The immunity of an American crisp type from downy mildew (*Bremia lactucae*) depends on a single dominant gene. Several F_4 progenies of the butterhead type, homozygous for this immunity, have been developed.

The winter glasshouse variety Cheshunt Early Giant has the property of not transmitting lettuce mosaic virus through seed. The attempt to transfer this character to summer lettuces continued.

Of the many *Lactuca* spp. tested for resistance to mosaic, only *L. georgica* has exhibited no symptoms after artificial inoculation. Attempts to cross *L. georgica* with *L. sativa* failed but it has been successfully crossed with *L. virosa*. Lindqvist [XXX, 4377] reported that he had crossed *L. virosa* with *L. sativa*. If it proves possible to cross the two interspecific hybrids, the chances of indirectly transferring the mosaic immunity of *L. georgica* to cultivated lettuce would be increased.

Tomato. Inheritance of the resistance of an accession of *Lycopersicon hirsutum* to *Didymella lycopersici* is apparently under polygenic control, breeding for resistance with this source thus being made difficult. A search for additional sources of resistance continued.

Über Fragen der Züchtung landwirtschaftlich genutzter Cruciferen. Vorträge anlässlich eines Symposiums vom 6.–8. Juli 1959 im Institut für Pflanzenzüchtung Gross-Lüsewitz der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. (**Questions of the breeding of crucifers used in agriculture. Papers read on the occasion of a symposium from 6–8 July 1959 in the Gross-Lüsewitz Institute for Plant Breeding of the German Academy of Agricultural Sciences at Berlin**).
Tagungsber. dtsch. Akad. Landwirtschaftsw. Berlin 1960 : No. 32 : Pp. 168.

Full versions of papers reported briefly elsewhere are presented [cf. XXX, 2017].

5462 PIELEN, L.
Entwicklung und Aussichten der deutschen Gemüsezüchtung. (**Development and prospects of German vegetable breeding**).
Saatgutwirtschaft 1961 : **13** : 163–66.

An historical outline of the state organization of vegetable breeding in West Germany is presented.

5463 MÜLLER, N.
Gemüsesaatgut—Neuheitenüberprüfung 1957/58. (**Vegetable seed—trials of novelties 1957–58**).
Mitt. Klosterneuburg : Ser. B 1959 : **9** : 103–22.

Trials of carrot, radish, cabbage, cauliflower, spinach, lettuce, cucumber, tomato, French bean and pea are reported.

5464 PÉCAUT, P. & FRIEDBERG, L.
Les plantes potagères. (**Market-garden crops**).
Bull. tech. Ing. Serv. agric. 1961 : No. 157 : 155–61.

In this discussion of the aims and present states of market-garden crop breeding in France, particular mention is made of the successful development of high-yielding single-cross hybrids of tomato and French bean varieties resistant to *Pseudomonas phaseolicola*.

5465 LÖBL, D. & SAVINOVA, N.
Realizările ştiinţei şi tehnicii sovietice în legumicultură. (**Soviet scientific and technical achievements in vegetable culture**).
An. Romîno-Soviet. : Ser. Agric.-Zooteh. 1960 : **14** : No. 1 : 87–95.

This review of Soviet vegetable culture includes references to vegetable breeding, in particular the work at the Gribovo research station.

5466 UŠAKOVA, E.
(**A pioneer of Soviet breeding of vegetable crops**).
Kartofel' i Ovošči (Potato & Vegetables) 1960 : No. 5 : 6–9. [Russian].

A brief outline is given of the history of the Gribovo Vegetable Breeding Station, near Moscow, some of the most outstanding among the 240 varieties of 43 different vegetables produced being referred to; 95 of them were produced by hybridization; they include sugar peas with large pods and seeds of the marrowfat type, early-ripening bush tomatoes, hardy outdoor tomatoes and early varieties of pumpkin, cabbage and other vegetables.

5467 HUYSKES, J. A.
De veredeling van groentegewassen in de Verenigde Staten van Amerika. (**The breeding of vegetable crops in the United States of America**).
Meded. Dir. Tuinb. 1961 : **24** : 366–70.

In this account based on observations made on a study trip in 1960, special reference is made to the emphasis on breeding for industrial processing rather than for the fresh market and to the important role played by private breeders compared with government stations.

5468 KATAOKA, S.
[Studies on the breeding of fruit vegetables. On (I) tomato and (II) cucumber].
Tamagawa Daigaku Nogyobu Kenkyu Hokoku/Bull. Fac. Agric. Tamagawa Univ. 1960 : No. 1 : 47–61. [Japanese].

Tomato. The degree of dominance and manifestation of heterosis in respect of earliness, fruit number, weight and yield, and plant height was ascertained from numerous intervarietal crosses. Correlations between these characters were also determined and their connexion with accumulated temperatures.
Cucumber. Correlations between plant height, node number, number of ♀ flowers, and number and yield of fruits in a series of Japanese varieties were investigated.

5469 YUKURA, Y.
(On the heritability of some all-or-none characters in vegetables).
Tamagawa Daigaku Nogyobu Kenkyu Hokoku/Bull. Fac. Agric. Tamagawa Univ. 1960 : No. 1 : 121–34. [Japanese].

The following heritability values were calculated: Kanamachi turnip, cracked roots in autumn sowing, 0·10–0·15; and cracked roots in summer sowings, 0·35–0·40; radishes, forked root, 0·15–0·30; cracked root, 0–0·15; resistance to virus, 0·20–0·30; resistance to soft rot, 0·10–0·30; and crooked root, 0·15; and spinach, resistance to high temperature, 0·65–0·70. Resistances to virus and soft rot in radish had a high negative genetic correlation.

5470 SCHREIBER, F.
Deutsche Gemüsezüchtungen. **(German vegetable varieties).**
Saatgutwirtschaft 1961 : Spec. Ed. : 14–15.

It is shown that new varieties of vegetables have been bred suitable for German and foreign markets.

5471 VAN DER VEKEN, H.
Considérations sur quelques variétés de plantes potagères cultivées dans la région de Gandajika (Kasai). **[Considerations on some vegetable varieties cultivated in the Gandajika region (Kasai)].**
Bull. agric. Congo 1960 : **51** : 1071–84.

Brief notes are given on some of the varieties of cabbage, red cabbage, cauliflower, rhubarb, Witloof chickory, Valerianella, tomato, melon and strawberry that are grown in this region.

5472 PHILIPP, F.
Qualitätsfragen in der Gemüsezüchtung. **(Quality questions in vegetable breeding).**
Mitt. Klosterneuburg : Ser. B 1959 : **9** : 97–102.

The concept of quality in vegetables is considered and the quality characters desired in some important vegetables are listed, mention being made of varieties which have these characters.

5473 LAMPRECHT, H.
Ein Bastard *Apium graveolens* L. x *Petroselinum hortense* Hoffm. **(A hybrid of *A. graveolens* L. x *P. hortense* Hoffm.).**
Agri hort. genet., Landskrona 1961 : **19** : 223–24.

A spontaneous hybrid between the celeriac Imperator and the parsley pollen parent Extra Mosskraus [Extra Moss Curly] had the broad root neck and the odour and flavour of the celeriac and the habit of an only slightly curly parsley. The hybrid failed to flower.

5474 REGGIANI, F.
"Fiumicino" la carota dell'Isola Sacra. **(Fiumicino, the carrot of the Isola Sacra).**
Ital. agric. 1961 : **98** : 473–85.

In the area between the ancient Roman cities of Porto and Ostia, in the vicinity of Fiumicino, the cultivation of carrots has been highly successful and a local cultivar, known as Fiumicino, has evolved. It is described as having regular, elongated roots with rounded ends, excellent flavour and high sugar content. It can be harvested from the middle of December to the end of April and attempts are being made to improve it still further by selection.

5475 MORAVEC, J. & KVASNIČKA, S.
Tržní hodnoty válcovitých karotek (*Daucus carota* L.) světového sortimentu. **[The market value of cylindrical carrots (*D. carota* L.) of the world collection].**
Sborn. čsl. Akad. zeměd. Věd : Řada rostlinná Výroba 1961 : **7** : 731–44.

The results are reported of a three-year trial of provenance types of well known varieties.

5476 VAN'T SANT, L. E.
Levenswijze en bestrijding van de wortelvlieg (*Psila rosae* F.) in Nederland. [**Biology and control of the carrot fly (*Ps. rosae* F.) in the Netherlands**]. Versl. landbouwkund. Onderzoek. 1961 : No. 67 : Pp. viii + 131; also Meded. Inst. PlZiektkund. Onderz., Wageningen No. 240; also Med. Proefsta. Groenteteelt volle Grond No. 20.

It is noted that varietal differences in attack are slight.

5477 SOSNOVEC, A. A.
(The cytology of the genus *Scorzonera* L.).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 1813–15. [Russian].

The chromosome numbers of 25 *Scorzonera* species are reported, some for the first time. *S. alexandrina* (2*n* = 42) was obtained from Orléans, France, while the other 24 were collected in various parts of the USSR. The species are divided into two caryological series; in the first, comprising 10 species, the basic chromosome number is 6, while in the other, the basic number is 7.

5478 TSVETOUKHINE, V.
Contribution à l'étude des variétés de topinambour (*Helianthus tuberosus* L.). [**Contribution to the study of varieties of Jerusalem artichoke (*H. tuberosus* L.)**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B. 1960 : **10** : 275–308.

An account of morphological and physiological studies on varieties in the collection at the Plant Breeding Station, Rennes, concludes with a key to the principal varieties.

5479 BĂČAROV, S.
(The Makovski onion).
Gradinarstvo (Horticulture) 1960 : **2** : No. 1 : 5–8 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 2 : Abst. 382 : 102–03. [Bulgarian]. (Mimeographed).

Of the many foreign onion varieties tested at Gorna Orjahovica in Bulgaria, the variety Makovski was found to be most suitable for export; it loses only 13% of its dry matter during storage, whereas the standard variety Ljaskovski 58 loses 20%.

5480 Uienonderzoek onder de loupe. (**Close-up of onion research**).
Zaadbelangen 1961 : **15** : 159–60.

It is mentioned that breeding work in the Netherlands is concerned with the induction of mutations, the development of disease resistance and shortening of the growth period. It appears to be possible to produce seed in one year, which means that the time required to breed a new variety may be reduced.

5481 Uienveredeling. (**Onion breeding**).
Zaadbelangen 1961 : **15** : 176–78.

At a meeting of the Netherlands Onion Federation held at Wageningen on 9 May 1961, J. Petiet reported that among 13 hybrids retained out of many hundreds tested at the Netherlands Institute of Horticultural Plant Breeding, one is three weeks earlier than the earliest Rijnsburg variety, is highly uniform, shows good keeping properties, has a high dry-matter content and has good skin quality; its yield is lower than desirable, however.

O. Banga described methods of selecting for various objectives. Selection for high dry matter content is effected by determining those with a high enough specific gravity to be able to sink in fluids of density 0·93 or 0·96. A wide variation in specific gravity was found, Van Primeur having 0–5% above 0·93 and Australian Brown and a Van der Steen variety 80–90%. Among commercial varieties tested for skin strength, none was uniformly good, although a few strong-skinned onions were found among some varieties. There is some evidence that a brownish-yellow skin is stronger than a white skin. Preliminary tests for resistance to *Botrytis allii* have revealed 64–78% freedom from infection in six out of 131 entries at Wageningen. It is noted that a Persian variety has been found, which when growing in the humid climate of the Caspian Sea area was entirely free from infection although all other varieties in the area were attacked.

5482 **First cabbage to resist clubroot.**
Agric. Res., Wash. 1961 : **9**: No. 8 : 15–16.

Badger Shipper, resistant to the most prevalent strains of club root (*Plasmodiophora brassicae*) in the USA, has been released cooperatively by the US Department of Agriculture and Wisconsin Agricultural Experiment Station.

5483 SAGALOVIČ, E.
(Din-zo-sn, the earliest white-headed cabbage).
Kartofel' i Ovošči (Potato & Vegetables) 1960 : No. 1 : 38–40. [Russian].

A description is given of Din-zo-sn, a large-headed cabbage developed at the Dalnen Experimental Station in northern China. The new variety is reported to be earlier maturing than Nomer Pervyj [Number One], Dymerskaja, Derbent and other standard varieties in several regions of the USSR. In some areas Din-zo-sn tends to be more susceptible to pests and diseases than other early-maturing varieties.

5484 Poerink, H. J.
Rand in witte kool. (**Tip burn in cabbage**).
Med. Proefsta. Groenteteelt volle Grond 1961 : No. 19 : Pp. 63.

Marked differences in incidence of tip burn have been found between varieties and between strains within varieties. Selection of healthy plants in plots with a high incidence caused by heavy N fertilizer treatment appears to be yielding favourable results. A cross between healthy plants of Roem van Enkhuizen [Enkhuizen Fame] and Late Herfstwitte [Late Autumn White] has given progeny entirely free from tip burn, while the F_1 of a comparable cross between affected plants showed 100% incidence.

5485 Stein, M., Skiebe, K. & Jahr, W.
Vordringliche Aufgaben bei der Züchtung des Chinakohls *Brassica pekinensis* Rupr. (**Pressing problems in breeding Chinese cabbage, *B. pekinensis* Rupr.**).
Züchter 1960 : **30** : 352–61.

It was found that in breeding varieties for forcing and open-ground cultivation and for storing, the resistance to bolting and bacterial soft rot should be improved. Tetraploids of the Chihli type appeared to be the most promising breeding material; they were superior to diploid Chihli and diploid Wong Bok plants in resistance to bolting and soft rot. These tetraploids were obtained by colchicine treatment of the variety Granat; a few tetraploids were also obtained by crossing $2n$ and $4n$ forms. Keeping plants at low temperature and low relative humidity was found to reduce winter losses due to rotting and seed could then be obtained from selected plants. Selections could also be propagated by cuttings and these produced seed in the following spring.

5486 Šikrová, M. & Repčík, P.
Vlastnosti a hodnota niektorých odrôd kŕmnej kapusty. (**The characters and value of some varieties of fodder kale**).
Za Socialist. Zeměd. 1959 : **9** : 994–99.

Details of the size, weight and chemical composition of eight varieties are given.

5487 Valenta, M.
Stanovení derivátů indolu v rostlinném materiálu III. Obsah askorbigenu v různých odrůdách růzičkové kapusty (*Brassica oleracea* var. *gemmifera* DC) a kapusty kadeřavé (*Brassica oleracea* var. *acephala* DC f. *plana* Peterm a f. *laciniata* L.) a jeho vztah k rustu a k volné kyselině L-askorbové v těchto rostlinách. [**Determination of indole derivatives in plant material III. The content of ascorbigene in different varieties of Brussels sprouts (*B. oleracea* var. *gemmifera* DC) and kale (*B. oleracea* var. *acephala* DC f. *plana* Peterm and f. *laciniata* L.) and its relation to growth and to free L-ascorbic acid in these plants**].
Sborn. čsl. Akad. zeměd. Věd : Řada rostlinná Výroba 1961 : **7** : 717–30.

Both the content of ascorbigene and of free L-ascorbic acid were found to be varietal characters; usually a high content of L-ascorbic acid was accompanied by a high content of ascorbigene.

5488 **New line aids spinach breeding.**
Agric. Res., Wash. 1961 : **9** : No. 8 : p. 13.

Developed by the US Department of Agriculture and Texas Agricultural Experiment Station, Line 214 is recommended for use in breeding, since it transmits several desirable features, including resistance to mosaic (cucumber virus 1) and damping off.

5489 Bose, S. & Janick, J.
Karyo-races in *Spinacia oleracea*.
Amer. J. Bot. 1961 : **48** : 238–41.

The chromosome-1 pair, which carries the *XY* factors, is usually homomorphic in staminate, monecious or pistillate plants, the standard chromosome 1 being heterobrachial, with one arm about twice as long as the other. As already reported [2686], line PI169671 from Turkey included plants heteromorphic for chromosome 1, one chromosome being considerably longer than the standard type and isobrachial. Some staminate and pistillate plants in Spica and Universal were also heteromorphic, one chromosome being of the standard type and the other bearing a satellite on the short arm. Plants homomorphic for the satellited or isobrachial chromosome have been obtained.

5490 Suto, T. & Sugiyama, S.
(Sex determination and expression in spinach. II and III. The breeding and genetics of intersexes).
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 215–22; 1961 : **11** : p. 29. [Japanese].

A detailed account is given of the genetics of sex in 3 andromonecious and 4 gynomonecious forms selected from a Japanese prickly variety. Intersexuality was sensitive to temperature, being expressed much more readily at higher temperatures. The andromonecious forms are of chromosome constitution XY^L, [cf. 2687], giving $1XX : 2XY^L : 1Y^LY^L$ plants on selfing. Y^LY^L plants give 100% males on crossing with XX females. The gynomonecious forms are of constitution XX.

It is suggested that the shift to intersexuality may be under the control of two genes, independent of the sex chromosomes, *F* changing XY^L from male to andromonecious, and *M* converting XX from female to gynodiecious.

5491 De Smedt, A.
Veredeling van kropsla. **(Lettuce breeding).**
Tuinbouwber., Groningen 1961 : **25** : 114–15.

Mention is made of varieties under test at Naaldwijk, Netherlands, including the new lines 57 (Blackpool x Interrex), 69 (Regina x Blackpool) and 39 (Kampioen [Champion] x Interrex). The last of these is the most promising.

5492 Dumonthay, J.
Une intéressante laitue pommée d'été "La Satellite". **(Satellite, a promising summer cabbage lettuce).**
Rev. hort. suisse 1961 : No. 2 : 55–57.

[Cf. XXX, 3277].

5493 Gjurov, S.
(The production of lettuce in frames).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1960 : No. 1 : 39–40. [Bulgarian].

Dickkopf, Tempo and Durana outyielded Majski Car [May King] and formed better heads in cold or partly heated frames at the Marica institute in Plovdiv. Their flavour and nutritive value were highly satisfactory.

5494 Breznev, D. D.
(Heterosis in Cucurbitaceous crops).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 7 : 34–43. [Russian].

In a brief review of the work of Soviet research stations, cases are cited where hybrids produce more growth substances and other physiologically active compounds than the respective parents. Data are presented showing that the number of pollen tubes that reached the ovary, the number of cells in the embryo sacs containing endosperm and the number of endosperm nuclei were all greater in tomato hybrids showing marked heterosis than in normal hybrids. Other cases are cited where heterosis has been produced by crossing small-fruited forms and early forms with late; yield increases of up to 50% are quoted.

At the Dokučaev Institute of Agriculture for the Central Chernozem Zone, hybrids of the water melons Ljubimec Hutora Pjatigorska [Favourite of the Pjatigorsk Farm] x Stoksa 647/649 gave a yield of 228·3 c. of fruit per ha., where the former parent yielded 171·3 c. and the latter 169·5 c.; the reciprocal cross gave no improvement over the better parent. Other hybrids gave yield increases of 30–60%. The hybrids were often earlier than the parents and usually had larger fruit with better quality. The use of water melons with melon-like leaves, a recessive character, as seed parent is recommended as a way of producing hybrids by open pollination.

Melon hybrids produced by using the multi-fruited melon Dnepropretrovskaja Rannjaja [Dnepropetrovsk Early] as seed parent and the large-fruited Koj-baš as pollen parent have given 12–13·5 kg. fruit from a single plant, where the former parent gave 6 kg. and the latter 10 kg. Several other promising melon hybrids are referred to, some of them possessing resistance to bacterial infection, mildew or low temperatures, others increased earliness or quality; yield increases of 50–94% are reported, the hybrids having given yields of up to 453 c. of fruit per ha.

Pumpkin hybrids giving increased yields are referred to, one of the best being Volžskaja Seraja 92 [Volga Grey 92] x Kit 599, which exceeded the parents by 85%. Hybrid 45, from Vitaminnaja [High Vitamin] x Karotinnaja 102 [High Carotene 102], exceeded the former parent by 25–30% in yield and had a carotene content of 12–16 mg. %.

These results are compared with those of some workers in other countries.

5495 POPOVA, D.
(New hybrid varieties of melon).
Gradinarstvo (Horticulture) 1960 : **2** : No. 2 : 7–10 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 2 : Abst. **384** : 103–04. [Bulgarian]. (Mimeographed).

Of several hybrids studied, Persian 5 x Italian Muscatello showed most promise. Its average yield was 18,870 kg. per ha., whilst Persian 5 and Italian Muscatello yielded 10,950 and 10,530 kg. per ha. respectively. The average weight of the hybrid fruit is 1,975 kg. and the flesh has a good flavour. In content of dry matter and sugar, it surpasses both parents.

5496 MOZSÁR, K.
Heterózis jelensége sárgadinnye fajtakeresztezéseknél. **(The phenomenon of heterosis in varietal crosses of musk melon).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **18** : 79–94.

Eighteen hybrid combinations, among them one Russian, one American and eight Hungarian varieties, were studied. Fruit set varied from 0% in four combinations to 42% in one, early morning being the most effective time for artificial pollination. A shorter vegetative period and higher early yields, total yields, soluble dry-matter content and sugar content than those of the better parent were found in more than half the F_1 hybrid progenies. In organoleptic properties, the hybrids were generally intermediate between the parents. Fruit characters mostly showed dominance of the female parent, and the segregation ratio for female *vs.* hermaphrodite flowers varied both in reciprocal crosses and according to hybrid combination. The combinations Magyar kincs [Hungarian Treasure] x Muscatello, Muscatello x Turkesztán [Turkestan] and Tiszagyöngye [Pearl of the Tisza] x Amerikai szabadföldi [American Outdoor] are recommended for further testing.

5497 EGOROVA, G.
(New standard melon varieties).
Kartofel' i Ovošči (Potato & Vegetables) 1960 : No. 4 : 50–51. [Russian].

Descriptions are provided of two new water melon varieties, Ogonëk [Small Fire] and Zimnij 344 [Winter 344] and four new melon varieties, Kok-tinny 1087, Tašlaki 862, Bajty-Kurgan and Novinka Dona [Don Novelty]. All are midseason varieties except Ogonëk, which is early ripening; the latter is reported to be more cold and anthracnose resistant than Stoksa Kievskij [Kiev Stokes].

5498 WHITNER, B. F. (JUN.).
A high-yielding, good quality, downy and powdery mildew-resistant cantaloupe.
Circ. Univ. Fla. agric. Exp. Sta. 1960 : No. S–122 : Pp. 6.

Seminole—a new cantaloupe resists mildews.
Sunshine St. agric. Res. Rep. 1960: **5** : No. 2 : p. 17.

Seminole is resistant to both *Pseudoperonospora cubensis* and *Erysiphe cichoracearum.* The fruits have an average weight of 2–2½ lb., thick salmon-pink flesh and a small cavity. The variety is the result of hybridization, a volunteer disease-resistant plant being an initial parent.

5499 FILOV, A. I.
(The problem of melon systematics).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 1 : 126–32. [Russian].

The history of the taxonomy of wild and cultivated melons is surveyed and the classifications of Pangalo and Grebenščikov are criticized, the former for raising the rank of some taxa and the latter for using new taxonomic concepts such as the conspecies, specioid and subspecioid [cf. XXIV, 3432]. A new classification of melons is presented in outline. It divides *Cucumis melo* into 6 subspecies, *rigidus, europaeus, orientale, flexuosus, sinensis* and *spontaneum*, each with a number of botanical varieties.

5500 HADWIGER, L. A. & HALL, C. V.
The relation of pigmentation and free amino acid content with resistance to *Colletotrichum lagenarium* in watermelons.
Plant Dis. Reptr. 1961 : **45** : 373–74.

Lesions resulting from infection with *C. lagenarium* (*Glomerella lagenaria*) were concentrated primarily on the dark green stripes of the mature fruits of Garrison. The upper cell layers of the dark green stripes contained much higher quantities of citrulline and glutamine and only slightly higher quantities of alanine and aspartic acid than the corresponding tissues of the light green stripes. Rind tissue below the dark green layers also had significantly more citrulline and glutamine than similar tissue beneath the light green stripes. The possible role of free aminoacids and of several other factors in the susceptibility of rind tissues is under investigation.

5501 WEILING, F.
Die Geschlechtsverteilung bei *Cucurbita*-Hybriden und ihre Beziehung zu einer Ansteckungsverteilung von Neyman.
(Sex distribution in *Cucurbita* hybrids and its relation to a contagious Neyman distribution).
Bull. Inst. agron. Gembloux : Hors Sér. 1960 : **1** : 242–55.

The development of male flowers was found to be strongly inhibited in interspecific hybrids; this effect was most marked in the F_2 of *C. maxima* x *C. pepo* hybrids back crossed to *C. maxima*. The distribution of the proportion of male flowers on a plant corresponded to a Neyman distribution in the F_2 but in the F_1, F_3 and F_4 there was a random distribution. It is supposed that in the F_2 male flowers develop in groups on the rare occasions when external and internal factors are favourable.

5502 SHIFRISS, O.
Sex control in cucumbers.
J. Hered. 1961 : **52** : 5–12.

On the basis of experimental data, the following hypothesis of sex control in the cucumber is suggested. At least three groups of genes govern sex expression during plant development. Firstly, a few qualitative genes determine the kinds of flowers which may be potentially differentiated. All plants possess the genetic potentiality of differentiating staminate flowers. In addition, monecious plants carry *G* for pistillate flowers and andromonecious individuals *g* for perfect flowers. Secondly, polygenes control the rate of accumulation or depletion of an as yet unknown substrate, the concentration of which channels the expression of the first group of genes. The polygenes thus determine the rate of sex conversion during plant development. Thirdly, a major gene, *Acr*, causes a pronounced acceleration in the rate of sex conversion. Thus, in a genetic background endowed with a relatively weak male tendency, as governed by the polygenes, the following four basic sex expressions behave in inheritance as fairly stable qualitative characters: gynecism *Acr G*; hermaphroditism, *Acr g*; monecism, *acr G*; and andromonecism, *acr g*. Subgynecious and subhermaphrodite plants are respectively defined as monecious and andromonecious forms carrying *Acr*. The environment also affects the entire pattern of sex differentiation during plant development. Factors such as photoperiod, temperature and treatment with naphthalene acetic acid and gibberellins may affect the substrate. Sex variations in *Cucumis melo* may also be interpreted according to the above hypothesis. A similar hypothesis has been proposed as a means of explaining sex control in *Ricinus communis* [XXVI, 2630].

5503 MEŠČEROV, E. T.
(New cucumber hybrids).
Sel'sk. Hozjajstv. sev.-zap. Zon. (Agric. NW Zone) 1960 : No. 6 : 28–30 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G605 : p. 56. [Russian].

New heterotic hybrids of indoor and outdoor cucumber are described.

5504 ŠTAMBERA, J.
Průzkum vlastností prvních filiálních generací při šlechtění skleníkových odrůd okurek na heterózní efekt. **(An investigation of the characters of the first filial generations in breeding glass-house varieties of cucumber for heterosis effect).**
Sborn. čsl. Akad. zeměd. Věd : Řada rostlinná Výroba 1961 : **7** : 705–16.

Heterosis in the seven combinations investigated was particularly marked in the growth of the main stem. Some undesirable qualities such as the warts and spines on the fruit surface of the variety Bej-czin-da-cy-qua and the whitish yellow colour of Langi were dominant but the white skin of Bílá [White] was recessive in a cross with Spot Resisting. The best cross was Spot Resisting x Bílá, the fruit having a smooth soft skin and fine flesh of good flavour.

5505 PEVELING, E.
Elektronenmikroskopische Untersuchungen an Zellkernen von *Cucumis sativus* L. **(Electron microscope investigations on cell nuclei of *C. sativus* L.).**
Planta 1961 : **56** : 530–54.

Studies of the interphase and mitotic nuclei in root-tip cells are reported, OsO_4 or the Altmann fixation methods being used. Details of the structure of the nuclear membrane, nucleolus, chromocentres and chromosomes are provided. The last mentioned appeared to consist mainly of closely packed threadlike elements with a uniform thickness of 50 Å., surrounding a central noncontrasting region. Next to these elements and leading to the cytoplasm lies a zone about 600–700 Å. wide, containing helically coiled elements 100–120 Å. wide.

5506 GALČENKO, N. B.
(A cytological analysis of the cucumber plant, using rootlet, leaf primordia and tendrils).
Citologija (Cytology) 1960 : **2** : 475–77. [Russian].

The relative suitability of different tissues for the determination of ploidy level in cucumbers was investigated. It was demonstrated that tendrils were more suitable than rootlets and leaf primordia. Colchicine-induced tetraploids of the hothouse varieties Peking, Da-Bi-Cy, Dlinnoplodnyj [Long-fruited], Telegraph and Spot-resisting have been identified on the basis of cytological analyses of tendril tissues.

5507 NAKAMURA, N. & MAEKAWA, S.
(Vegetative hybrids of cucurbits. III. On a male-sterile individual of cucumber).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1960 : **4** : 175–78. [Japanese].

A male-sterile plant was found among the seed progeny of the scion of a cucumber/water melon graft. The male sterility appeared to be determined by a single recessive gene [cf. XXX, 3285].

5508 MUSTAFIN, A. M.
(Hermaphrodite forms of cucumbers).
Priroda (Nature), Leningrad 1961 : No. 3 : 113–14. [Russian].

Two repeated graft hybrids of cucumber on pumpkin with hermaphrodite flowers, which later developed some normal fruits, were obtained in Moscow experiments with the cucumber variety Nežin and the pumpkins Berjučij Kut 27 and Hybrid 13 respectively. The seed progenies are under observation to determine whether the acquired character is heritable.

5509 GALUN, E.
Gibberellic acid as a tool for the estimation of the time interval between physiological and morphological bisexuality of cucumber floral buds.
Phyton, Vicente López 1961 : **16** : 57–61.

The period between physiological bisexuality (defined as the stage of a floral bud at which it is still sensitive to sex-controlling factors) and morphological sexuality was estimated to be about seven days in a monecious line of the cucumber variety Beit-Alpha. Details are given of the techniques employed in this study with particular reference to gibberellic acid, which was used because of its ability to promote ♂ sex expression.

5510 DIERKS, W.
Sortenvergleich frühreifer Freilandtomaten. **(A comparison of varieties of early-ripening tomatoes for the open ground).**
Saatgutwirtschaft 1961 : **13** : 103–04.

Fifty-six varieties were tested in Hamburg-Volksdorf. Of the dwarf varieties, Manitoba, Meteor, Fireball and the F_1 hybrid Mustang gave the best results in respect of yield and quality. The F_1 hybrid Planet was the best of the taller varieties.

5511 TERADA, T. & NAGASAKA, K.
(Studies on tomatoes for processing. VI. On the characteristics of Italian tomato strains for processing).
Shimane Naka Daigaku Kenkyu Hokoku/Bull. Shimane agric. Coll. 1960 : No. 8A : 99–106. [Japanese].

Data are provided on the yield and fruit colour of six strains introduced from Italy.

5512 HUANG, P.-C.
On the action of the semi-dominant lethal gene, *Wo*, in *Lycopersicon esculentum* Mill.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–4098 : p. 738. (Abst.).

The hypothesis of a sporophytic time of lethal action for *Wo* was confirmed. *WoWo* embryos ceased growth at the "torpedo" stage, dying just before fruit maturation. The endosperm cells continued to increase in size and number, and remained mostly undigested. Seeds with a *WoWo* embryo therefore attained full size, being distinguishable from those with a *Wowo* or *wowo* embryo on the basis of testa topography. Embryo-endosperm graft experiments indicated that the lethal action of *Wo* was specific to the embryo. The process responsible is considered to be a defect in digestive-enzyme synthesis, although substrates from the endosperm are available. A threshold effect is postulated for *Wo*. No appreciable difference was found between genotypes *Wowo* and *wowo* in embryogenesis; heterozygotes were recognizable only after emergence of the hypocotyl and cotyledons. According to observations on grafts between *Wowo* and *wowo* plants, the *Wo*-controlled metabolite causing "woolliness" is nondiffusible between scion and stock. The partial inhibitory action of *Wo* upon ovule formation was inferred from an analysis of seed number per fruit in selfed and test-crossed *Wowo* and *wowo* plants.

5513 MAHALOVA, M. R.
(The choice of parental varieties in developing heterotic tomatoes).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 246–50. [Russian].

The performance of the F_1 to F_3 progenies derived from a series of intervarietal crosses was studied at the Institute of Genetics during 1957–59. The outstanding combinations were Gruntovyj Skorospelyj [Early Outdoor] x Rouge Ronde [Round Red], Štambovyj Alpat'eva [Alpat'ev's Bush] x Rouge Ronde and Rouge Ronde x Štambovyj Alpat'eva. These hybrids, notably the F_1 generation, showed marked heterosis for yield, vigour in unfavourable weather conditions and resistance to mosaic. It is pointed out that the parent varieties of the above crosses are of widely differing geographical provenance.

Hybrids produced by crossing varieties with diverse morphological characters did not give promising results. Mikado x Napoleon Bunch hybrids gave higher yields than the parent varieties but the fruits were small and showed prominent ribs. Crosses of Smorodinovidnyj [Currant tomato] with Mikado and with Zolotaja Koroleva [Yellow Queen] showed heterosis for number of fruits, plant height and yield. However, the fruits were too small to be of marketable quality.

5514 VLADIMIROV, B.
(New heterotic varieties of tomato for industrial preparation).
Gradinarstvo (Horticulture) 1960 : **2** : No. 3 : 4–7 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 3 : Abst. 629 : 51–52. [Bulgarian]. (Mimeographed).

The hybrid Rutgers x Sarja and Kecskemét x Rutgers yielded 70,650 and 72,800 kg. per ha. respectively, whereas Kecskemét–363 gave 64,500 and Rutgers 51,000 kg. per ha. In content of dry matter, pulp production and quality, the two hybrids and Kecskemét–363 surpassed Rutgers.

5515 DASKALOV, H., JORDANOV, M. & POPOVA, D.
(Investigations on tomato varieties for the canning industry).
Izv. central. naučn.-izsled. Inst. Rasten. (News central sci.-res. Inst. Pl.-Industr.), Sofija 1960 : **9** : 5–15 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 848 : 59–60. [Bulgarian]. (Mimeographed).

The hybrid varieties Rutgers x Sarja, 10 x Rutgers and Kecskemét x Rutgers were outstanding for their earliness and high yield of fruit. The yield of tomato pulp from Rutgers x Sarja was 128% of that of the standard Rutgers and Kecskemét x Rutgers was second in this respect; the hybrids produced high quality purée.

5516 LINDEN, M. I.
(Interspecific hybrids obtained by crossing *Lycopersicon esculentum* Mill. x *L. hirsutum* Humb. et Bonp.).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 251–56. [Russian].

L. esculentum 'Zolotoj Šar' [Golden Globe] x *L. hirsutum* vegetative hybrids were crossed with *L. hirsutum.* The F_1 and F_2 progeny included forms showing *L. hirsutum* characteristics as well as others similar to cultivated tomato. Selected F_1 plants of the cultivated type were then crossed with Best of All and detailed observations were made on the resulting F_1 and F_2 progeny. One F_2 family, derived from a cross in which Best of All had acted as the ♀ parent, was particularly noteworthy; it possessed certain *L. hirsutum* characteristics but had large, bright-yellow fruits weighing up to 100 g. each. A number of hybrids showed resistance to autumn frosts which were intense enough to destroy the cultivated parent varieties. Resistance to tobacco mosaic virus was also observed in certain hybrids.

5517 ALPAT'EV, A. V. & JUR'EVA, N. A.
(Hybridization of remote tomato forms).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 12 : 40–42. [Russian].

A number of promising hybrids were developed at the Gribovo Breeding Station by crossing three small-fruited, high dry-matter Bulgarian *Lycopersicon esculentum* x *Solanum racemigerum* lines, Sofia Konserva, Plovdiv Konserva and No. 10, with standard, large-fruited Russian varieties. The best results were obtained when the Bulgarian lines were used as pollen parents. The outstanding crosses were as follows: Krupnoplodnyj Gribovskij [Large-fruited Gribovo] x Plovdiv Konserva, which, in a 1959 test, had an average dry-matter (DM) content of 8·1% and yielded approximately 300 c. per ha.; Tepličnyj Gribovskij [Gribovo Hothouse] x Sofia Konserva, with an average DM content of 7·7%; and Kolhoz 34 x Plovdiv Konserva, which had an average DM content of 7·4%. The last two hybrids yielded about 270 c. per ha. in 1959. All three crosses begin to ripen in the first week of August.

Details are also provided of the performance of F_1 and F_2 lines derived by crossing standard large-fruited varieties with a number of Cicin's tomato-*Cyphomandra* vegetative hybrids; the latter are large-fruited and late-ripening and have a high (8–11%) DM content. Both F_1 and F_2 lines were late-ripening and were undistinguished in yielding capacity and DM content. This group of crosses does not appear to be of potential value in the Moscow district.

5518 LANGRIDGE, J. & BROCK, R. D.
A thiamine-requiring mutant of the tomato.
Aust. J. biol. Sci. 1961 : **14** : 66–69.

The spontaneous occurrence of a single-gene recessive mutant requiring thiamin is reported. The specific reaction lost was either the methylation of position 2 or the activation of position 5 of the pyrimidine ring.

5519 MASUBUCHI, N.
(Studies on Solanaceous grafts. I. On the formation of chimeras involving tomato and *Solanum nigrum*).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1961 : **74** : 34–41. [Japanese].

A morphological, anatomical and cytological description is given of chimeras obtained by grafting *S. nigrum* on tomato. Three of the chimeras corresponded to Winkler's *S. koelreuterianum* and one to *S. gaertnerianum.*

5520 MANOLIU, M. & PÎRVU, T.
Observaţii cu privire la modificarea unor caractere şi însuşiri la Solanaceae în cazul hibridărilor vegetative şi al hibridărilor sexuate. (**Observations on the modification of some characters and qualities in the Solanaceae in vegetative hybrids and in sexual hybrids**).
Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1960 : 217–26.

Alterations in fruit colour, number of locules, fruit shape and weight, vegetative period and form of inflorescence have been effected in the first-generation seed progeny of intervarietal tomato grafts and grafts between tomato and *Solanum nigrum.* Chromosome number was not affected.

5521 LAZÁNYI, A.
Caracteristicile variabilităţii la generaţiile de sămînţă după altoirea dintre tomate şi cartofi. (**The characteristics of the variability in the seed generations following grafting between tomato and potato**).
Stud. Cercet. Biol., Cluj 1960 : **11** : 173–83.

A variety named Dietetic-Cluj with long (12·3 cm.) narrow fruits and a high content of dry matter, sugars and ascorbic acid has been selected from the advanced seed generations raised from the stock of the graft Indian potato/Umberto tomato.

5522 BYKOV, B. A.
(**Čudesnyj Karlik**).
Priroda (Nature), Leningrad 1961 : No. 1 : p. 114.

The tomato Čudesnyj Karlik [Wonderful Dwarf] was bred at Gribovo. It is a high-yielding, early, determinate, bush type well adapted to mechanized cultivation. The fruits have a pleasant flavour and keep well. Seven other good determinate bush types bred in the USSR are listed.

5523 KEMP, G. A.
The pedigree of varieties of *Lycopersicon esculentum* Mill.
Canad. J. Pl. Sci. 1961 : **41** : 371–76.

Pedigree charts are given which trace the origins of (1) varieties primarily of historical significance in current breeding programmes and (2) early-maturing determinate varieties used in breeding in the Prairie region of western Canada.

5524 GRIFFITHS, A. E.
New tomato variety developed at URI.
RI Agric. 1960–61 : **7** : No. 2 : p. 3.

An indeterminate type, Summer Sunrise is high yielding and early in maturity, bearing large, crack-resistant fruits. It was developed at the Agricultural Experiment Station, University of Rhode Island, first by crossing Farthest North, a small-fruited, very early, cold-resistant variety, with Valiant, a larger-fruited, later and more vigorous type, and then back crossing with Valiant.

5525 MALIANI, C.
Il pomodoro Gimar. (**The tomato Gimar**).
G. Agric. 1961 : **71** : p. 119.

The fruits of Gimar [cf. XXX, 3302] remain fresh much longer than those of most cultivars and have an average vitamin C content of 50 g. %, which is about twice that of other varieties.

5526 WEILING, F.
Über zeitweilige, partielle Auflösung der Kernmembran in frühen Meiosisstadien bei Tomate. (**Temporary, partial dissolution of the nuclear membrane in early stages of meiosis in tomato**).
Naturwissenschaften 1961 : **48** : p. 138.

In early prophase, vacuoles appear in the cytoplasm and later penetrate the nuclear membrane, the contents of the vacuoles apparently diffusing into the nucleus. The nuclear membrane is reorganized during pachytene.

5527 VINOGRADOV, P. I.
(Breeding early tomato varieties tolerant of cold in Moldavia).
Agrobiologija (Agrobiology) 1960 : No. **3** : 356–60. [Russian].

Experiments on hardening young tomato plants for improvement of earliness and yield in Moldavia are discussed. Among varieties showing a good response to the treatment was Sverhrannij V84 [Ultraearly V84], which was originally obtained by grafting selected seedlings of Bison 2829 on an unspecified wild frost-resistant potato. Mention is made of Frunze, a new early variety tolerant of cold. It was obtained by continuous selection of Majak [Light-house] whose heritable basis had been shattered by ultraearly sowing for several generations.

5528 BARR, R.
Variation in the tomato leaf mold organism, *Cladosporium fulvum* Cke.
Diss. Abstr. 1960 : **21** : LC Card Mic 60–4147 : 1015–16. (Abst.).

The results from heterocaryon tests of biochemical mutants suggested that heterocaryosis may be responsible for variation in *C. fulvum.* Contradictory evidence was however obtained from the inability of heterocaryons to be transferred from one minimum medium to another by means of spores. This failure could be explained by the production of spores which were of one or the other parent type.

5529 HENDERSON, W. R. & WINSTEAD, N. N.
Reaction of tomato varieties and breeding lines to *Fusarium oxysporum* f. *lycopersici* race 1.
Plant Dis. Reptr. 1961 : **45** : 272–75.

Of the 100 varieties and breeding lines tested for reaction to inoculation with the above race in the greenhouse, 55 were resistant and 2 segregated for resistance. Thirty-four of the 39 STEP (Southern Tomato Exchange Program) lines included were resistant. The procedures of inoculation were designed to eliminate plants carrying only multigenic resistance (type B). Each of the varieties and lines graded as resistant is considered to possess type-A resistance, conferred by *I*.

5530 VON DER PAHLEN, A.
Identificación del "mosaico del tabaco" y del "mosaico del pepino" sobre tomate en los alrededores de Buenos Aires.
(Identification of tobacco mosaic and cucumber mosaic on tomato in the environs of Buenos Aires).
Rev. Invest. agríc. B. Aires 1961 : **15** : 139–52.

A Californian *Lycopersicon esculentum* x *L. peruvianum* hybrid showed resistance to tobacco mosaic virus; the gene for resistance appears to be linked with a gene for virescence.

5531 RAJKI-CICER, E.
[Vegetative hybrids of egg plant (*S. melongena*)].
Acta agron., Budapest 1960 : **10** : 267–92. [Russian].

This is a Russian version of a paper already summarized from the Hungarian [cf. 3978].

5532 L'VOVA, P. F.
(Breeding and seed production of leguminous crop plants at the V. V. Dokučaev Agricultural Institute for the Central Chernozem Belt).
Bjull. Ukrain. naučn.-issled. Inst. Rastenievodstv. Selekc. Genet. (Bull. Ukrain. sci.-res. Inst. Pl. Industr. Breed. Genet.) 1959 : No. **6** : 31–34 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G567 : p. 53. [Russian].

The breeding of vetch, *Phaseolus* bean and peas is mentioned. The results include dwarf and semidwarf types of pea obtained by crossing Victoria Mahndorf with *Pisum fulvum* and some selections originating from Afghanistan.

5533 ARUTJUNJAN, A. M.
(The results of varietal tests of some Leguminous crops in the districts of the Sevan basin).
Izv. Min. sel'sk. Hoz. Arm. SSR (News Min. Agric. Arm. SSSR) 1960 : No. **2** : 23–30 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G560 : p. 52. [Russian].

Trials of broad bean, French bean, pea, chickpea and lentil are reported. Three lentil varieties which were highly productive in all districts are listed.

5534 RAMÍNEZ, O. D. & QUIÑONES, J. A.
Snap bean-variety trials at the Lajas substation.
J. Agric. Univ. PR 1961 : **45** : 26–31.

A report is given on tests of 21 varieties and six lines at the above substation in Puerto Rico.

5535 CALZADA BENZA, J.
El cultivo del frijol en la Sierra. **(The cultivation of French bean in the Sierra).**
Agronomía, Lima 1960 : **27** : 373–83.

The results of extensive varietal trials in the Sierra region of Peru are reported. Among the varieties which performed well were Blanco Castilla [Castille White], Blanco Gigante [Giant White], Negro [Black], Canario and California.

5536 KEDAR, N. & BEMIS, W. P.
Hybridization between two species separated by physiological and morphological blocks. Some experiments in the genus *Phaseolus*.
Bull. Res. Counc. Israel 1961 : **9D** : 196–97. (Abst.).

When crossed with *Ph. coccineus* 'Scarlet Runner', three varieties of *Ph. vulgaris* gave rise to the seed-sterile T type of dwarf, while another variety of *Ph. vulgaris*, Blue Lake, produced the B type of dwarf which dies a few weeks after germination [cf. 4005]. The loci responsible for B and T dwarfs are inherited independently. The occurrence of three alleles at each of these loci (B and T) is postulated. B^V is "incompatible" with B^C, B dwarfs thus being produced. B^{VC} is "compatible" with both B^V and B^C. Similar relationships are suggested for a corresponding series of T alleles. "The cross compatible genotype between *P. vulgaris* and *P. coccineus* would be $T^{VC}T^{VC}$-$B^{VC}B^{VC}$."

5537 SCHWARZE, P.
Untersuchungen über die Ursachen der Peroxydasevermehrung in gestörten *Phaseolus*-Artbastarden. **(Studies on the causes of the increase of peroxidase in abnormal interspecific hybrids of *Phaseolus*).**
Planta 1961 : **56** : 691–99.

Abnormal hybrids were found to produce more of the peroxidase apoenzyme than normal hybrids [cf. 2734].

5538 TEDORADZE, S. G.
(The effect of ionizing radiation on plants).
Priroda (Nature), Leningrad 1961 : No. 4 : 104–05. [Russian].

An account of experiments on induction of mutations in *Phaseolus* and soya bean by treatment of the seed with γ rays is given. Some mutants of *Phaseolus* were 8–10 days earlier and 20–31% more productive than the initial variety. The mutants of soya bean also included plants characterized by improved earliness and yield.

5539 RUDORF, W.
Über die mutagene Wirkung von S^{35} bei *Phaseolus vulgaris*. **(The mutagenic effect of S^{35} in *Ph. vulgaris*).**
Z. Pflanzenz. 1961 : **45** : 69–90.

Seeds were soaked in solutions containing (1) 68·7 μc., (2) 34·35 μc. and (3) 3·435 μc. of S^{35}. With increasing dose, lethality, total sterility and partial sterility (seeds per pod) in the irradiated generation (M_1) increased and germination in the M_2 decreased. No morphological aberrant forms were found in the M_2 (4500 plants). In the M_3, seeds from partially sterile M_2 pods gave a higher proportion of aberrant plants than those from normal pods. Certain physiological and morphological changes showed M_3 segregation ratios of 1 : 7 to 1 : 47; these aberrant forms were sterile however, and the changes did not recur in sister progenies. The frequencies of aberrant plants did not vary significantly with dose, being 4·38% for (1), 2·44% for (2) and 3·75% for (3). Point mutations affecting plant colour, habit, fertility, petal colour, cotyledon shape and colour and form of the pods and testas were detected. In some M_3 plants several genes appeared to have mutated simultaneously.

5540 RIZZOTTO, N.
La produzione di semente selezionata del fagiolo di Lamon. **(The production of selected seed of the Lamon French bean).**
Agricoltura d. Venezie 1961 : **15** : No. **3** : 134–44.

Though the bean in question is normally self pollinated, a certain amount of cross pollination occurs. Four main types are known, being designated Spagnolo [Spanish], Spagnolit, Calonega and Canalino or Furianoi respectively, the last being considered somewhat inferior to the other three in quality. Selected seed of each type is being multiplied in isolated reproduction plots. Data are given on the main characteristics of the plant and flowers and the times of flowering and maturity in each of the four lines.

5541 NANDKEOLYAR, M. D. & DADLANI, S. A.
N.P. 23 green gram is a winner.
Indian Fmg. 1961 : **10** : No. 12 : 14, 27.

Recommended for north Bihar, *Phaseolus aureus* 'NP23' is superior in both yield and cooking quality to other varieties. It requires about 75 days from sowing to ripening and has a 1000-seed weight of 29 g. and protein content of 23·8%.

5542 ANDERSEN, A. L., DOWN, E. E. & WHITFORD, G.
The Sanilac pea bean—its history, development and characteristics.
Quart. Bull. Mich. agric. Exp. Sta. 1960 : **43** : 214–36.

A detailed account is given of *Phaseolus vulgaris* 'Sanilac' [XXVII, 3564, 3569]. In addition to being resistant to *Colletotrichum lindemuthianum* and tending to escape infection by *Sclerotinia sclerotiorum* on account of its growth habit, the variety is resistant to common bean mosaic virus 1 and *Pseudomonas phaseolicola.*

5543 ALPAT'EV, A. V. & MUHANOVA, JU. I.
(Hybrids of French beans obtained by pollination of unemasculated flowers).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 5 : 60–66. [Russian].

In continuation of earlier experiments [XXVIII, 3506], observations were made on 34 F_2 families from different crosses performed without emasculation. All the hybrids had a higher germination energy than the parents and many of them were more cold resistant and more vigorous; most families contained some plants that flowered before the parent varieties. The majority of hybrids were equal or superior to the more productive parent in yield, some of them exceeding it by 34%. Increases in 100-seed weight were also observed. Variation occurred in a number of features and some hybrids had attributes, such as yellow pods or orange seeds, not present in the parents or the F_1.

The best hybrids were those from the cross Saharnaja Gribovskaja [Gribovo Sugar] x Masljanaja Rannjaja [Early Butter], which had green pods of the asparagus bean type, many of them being sugar forms with either marbled or light-green pigmentation.

In the F_3 generation some lines ripened up to five days earlier than the parents. The best lines were selected and the F_4 from them was distinguished by cold resistance, earlier germination and flowering and slightly earlier maturity than the parent varieties, which they exceeded by 15–35% in yield. Two promising dwarf lines have been selected from the F_5.

5544 RĂDULESCU, E., FELECAN, V., RIPEANU, G., PERSECĂ, E. & POP, E.
Comportarea unui sortiment de fasole la atacul principalelor boli. **(The behaviour of an assortment of French beans in response to infection by the principal diseases).**
Lucrăr. şti. Inst. agron. P. Groza, Çluj 1960 : **16** : 149–75.

Data are provided on the yield, pigmentation and degree of resistance to *Phaseolus* virus 1, *Xanthomonas phaseoli, Colletotrichum lindemuthianum* and *Uromyces appendiculatus* of 378 Rumanian and introduced varieties tested during 1949–59.

5545 CARDONA ALVAREZ, C.
Líneas de fríjol, resistentes a la roya, seleccionadas en el Centro Nacional de Investigaciones Agrícolas "Tulio Ospina" (Medellín). **[Rust-resistant French bean lines selected at the Tulio Ospina National Centre of Agronomic Research (Medellín)].**
Agricultura trop. 1961 : **17** : 90–97.

The main characteristics of two rust-resistant selections, Uribe Redondo L41 [Uribe Round L41] and Algarrobo L102 [Carob L102], are described. The results of varietal trials involving 16 Algarrobo and 6 Uribe Redondo resistant selections, as well as nonresistant controls, demonstrated the higher yields obtainable from resistant varieties under conditions where *Uromyces phaseoli* var. *typica* is prevalent.

5546 HIKIDA, H. R.
Race 33 of *Uromyces phaseoli* var. *typica* Arth., a distinct physiologic race of bean rust from Oregon.
Plant Dis Reptr. 1961 : **45** : p. 388.

Since a race collected in the Willamette valley of Oregon differed in its reactions on differential bean varieties from all of the 32 previously described races, it is considered to be a distinct race and has been designated race 33.

5547 TAHON, J. & BOXUS, P.
Quelques remarques sur la mosaïque du haricot (*Phaseolus* virus 1). **[Remarks on bean mosaic (*Phaseolus* virus 1)].**
Meded. LandbHogesch. Gent 1960 : **25** : 1148–53.

In greenhouse inoculation tests, Probator, Aromator, Wade, Granda, Super Métis [Super Hybrid], Roi des Belges [King of the Belgians], Furore, Widusa and Flageolet Roi des Nains

[King of the Dwarfs bean] were immune or hypersensitive, while Métis was a symptomless carrier.

5548 ALLARD, R. W.
Relationship between genetic diversity and consistency of performance in different environments.
Crop Sci. 1961 : **1** : 127–33.

"The productivity in field trials at 4 locations during 4 years of 10 lima bean populations representing 3 levels of genetic diversity was tested to determine whether productivity and stability of productivity are related to genetic diversity.

"Simple mechanical mixtures of 2 or 3 pure lines were consistently slightly less productive than the mean of the component pure lines grown singly. Genetically complex populations derived by bulk propagation from hybrids between the same parents, in contrast, yielded as much as the superior pure-line parent, or more. From the evidence, the superiority of complex hybrids over simple mixtures was associated not with heterosis but in part with the ability of different genotypes to exploit particular ecological sites to their own particular advantage and in part with the elimination of poorer-yielding genotypes by natural selection during propagation in bulk of the hybrid populations.

"Pure-line populations were less stable in productivity than mixed populations. There was little difference in stability of mixed populations, whether only two or many genotypes were involved, which suggests that genetic diversity endows intra-specific mixtures with the ability to produce consistently, more or less irrespective of the number or attributes of their components. Mixtures appear to be insured against very low yields, but the genetic and ecological forces that produce stability in production do not necessarily endow mixtures with high average productive capacity.

"The bulk hybrid populations investigated generally did not make the highest yields in any one environment, but they were only slightly less likely to make exceptional yields than pure-line varieties. Since these bulks had not been deliberately compounded of high-yielding and compatible lines, the result offers encouragement that rational blends of pure lines chosen for uniformity of appearance and quality may, apart from their value in stabilizing yield, also raise the yield of the blend beyond that of the best adapted variety."

[Author's summary].

5549 FLORESCA, E. T., CAPINPIN, J. M. & PANCHO, J. V.
A cytogenetic study of Bush Sitao and its parental types.
Philipp. Agric. 1960 : **44** : 290–98.

Bush Sitao is a true-breeding hybrid between *Vigna sinensis* 'California Blackeye' and *V. sesquipedalis* 'Singapore' [cf. XXX, 1077]. Meiosis was normal in the two parents and hybrid, all three having $2n = 24$. The meiotic regularity of Bush Sitao, together with its high degree of pollen fertility, indicates that the genomes of the two species are closely homologous. Pod-setting percentages of 21·60, 22·0 and 2·50 were respectively obtained by back crossing Bush Sitao as ♂ with Singapore and California Blackeye and Bush Sitao as ♀ with California Blackeye. The bushy habit of *V. sinensis* was dominant in the back crosses; the character of desirable pod type, derived from *V. sesquipedalis*, was also expressed.

5550 LEŠČENKO, A. K.
(**Some methodological problems of breeding the soya bean in the Ukraine**).
Bjull. Ukrain. naučn.-issled. Inst. Rastenievodstv. Selekc. Genet. (Bull. Ukrain. sci.-res. Inst. Pl. Industr. Breed. Genet.) 1959 : No. 6 : 62–67 : from Ref. Ž. (Ref. J.) 1961 : No. 2 : Abst. 2G322 : p. 32. [Russian].

Methods which are thought to be useful in breeding, and promising breeding material are described.

5551 ZOVKIĆ, I.
Sortni ogledi sa sojom u sjevernoj Bosni. (**Varietal trials with soya bean in northern Bosnia**).
Savremen. Poljopr., Novi Sad 1960 : **8** : 891–94.

Mandarin, Manchu Montreal, Zagrebačka Rana [Early Zagreb], Mandin Hajon and Manchu Hudson were distinguished by high annual yields and lodging resistance among the mid-season varieties tested at Derventa. Of the early varieties, Goldsoy was the most satisfactory in the above respects.

5552 ARAKAKI, S.
(**Investigations on the characters of Ryukyu soya-bean strains and Kyushu summer soya-bean strains**).
Ryukyu Daigaku No Kasei Kogaku Bu Gakujutsu Hokuku/Sci. Bull. Div. Agric. Home Econ. Engng. Univ. Ryukyu 1960 : No. 7 : 328–34. [Japanese].

A detailed study of the comparative suitabilities of selected soya-bean varieties of the above types for cultivation in the Ryukyu islands is presented. It is noted that the Ryukyu varieties are genetically heterogeneous.

5553 Brim, C. A. & Cockerham, C. C.
Inheritance of quantitative characters in soybeans.
Crop Sci. 1961 : **1** : 187–90.

Two populations, one from N48–4860 x Lee and the other from Roanoke x Lee, were studied, and estimates of progeny components of variance were obtained for nine characters. Six genetic models—(1) additive, (2) dominance, (3) additive x additive, (4) additive and dominance, (5) additive and additive x additive and (6) additive, dominance and additive x additive —were fitted to ten estimates of the progeny components of variance and covariance for each character. The results indicate that additive variance is the principal component of genetic variance for all characters. The effect of inbreeding the parents before evaluating their progenies was examined with respect to yield and oil and protein content. The additional gain was found to increase with inbreeding, but at a decreasing rate. It is concluded that it would almost always be advantageous to inbreed the parents to the F_3, and often to the F_4, before evaluating progenies.

5554 Nagata, T.
Morphological, physiological, and genetic aspects of the summer vs. autumn soybean habit, the plant habit, and the interrelation between them in soybeans.
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1960 : **4** : 71–95.

Much of the information presented is summarized from a number of earlier publications. It is considered that the most satisfactory criterion for the separation of determinate from indeterminate growth types is the number of nodes developed above the point of formation of the first flower. Node frequency-distribution curves in the F_2s of three determinate x indeterminate crosses exhibited two modes, one at 3–4 nodes and the other at 10–12 nodes, conditioned by alleles *dt* and *Dt* respectively; a number of minor genes are thought to be involved.

The length of the flowering period was clearly correlated with growth type, irrespective of maturity rating. The period required for seed formation was also associated with growth type, but this was more marked in early varieties. An association was found between growth type and vine habit.

5555 Leffel, R. C. & Hanson, W. D.
Early generation testing of diallel crosses of soybeans.
Crop Sci. 1961 : **1** : 169–74.

Attempts were made to determine the value of parental and early-generation progeny performance in identifying crosses likely to yield desirable segregates. The 10 parents and 45 F_1 progenies used were those described earlier [cf. XXIX, 2057]; space-planted F_2, bulked F_2, bulked F_3 and F_3 line generations were also studied [cf. XXX, 1238]. The data were subjected to different analyses to determine the general and specific effects of the parents and the presence or absence of epistasis, dominance and additive gene action. General effects were conspicuous for seed yield and size and for plant maturity. Specific effects for plant maturity and height were identified using the combining ability method of Rojas and Sprague [cf. XXIII, 1140] but not by the regression of array covariances on array variances. Associations between maturity and other characteristics are presented for each generation. A highly significant positive correlation was found between maturity and seed yield in all except the F_1 generation, and between maturity and plant height in all generations. Purple stain (*Cercospora kikuchii*) and seed quality scores were negatively correlated with maturity; seed size was positively associated with maturity in all generations. It is concluded that the performance of parents or their crosses in early bulk generations is a reliable indicator of the performance of F_3 lines.

5556 Sebők, C. M. & Márki, A.
Contribuţii privind problema hibridării vegetative la soia. (**Contributions towards the problem of vegetative hybridization of the soya bean**).
Lucrăr. şti. Inst. agron. P. Groza, Cluj 1960 : **16** : 63–74.

No seed was set on scions of the graft *Glycine hispida/Vigna sinensis.* Lines with increased yield and higher catalase activity are reported in the first seed generation from the scion of the soya-bean graft Mauthner galben cu bob mic [Small-grained Yellow Mauthner]/Wisconsin Black.

5557 PAPA, K. E., WILLIAMS, J. H. & HANWAY, D. G.
Effectiveness of selection for quantitative characters in the third generation following irradiation of soybean seeds with X rays and thermal neutrons.
Crop Sci. 1961 : **1** : 87–90.

The effectiveness of selection for yield, maturity, seed weight, oil content and protein content in irradiated and nonirradiated populations of Adams and Hawkeye was investigated. As regards yield, selection was effective in both Hawkeye populations, but the advantage was just sufficient to compensate for the lower initial yield of the unselected irradiated population as compared with the nonirradiated control. Selection for high yield was ineffective in the Adams populations studied.

As regards the other more highly heritable characters, selection was generally more effective in the irradiated than in the nonirradiated populations of both varieties; significant gains were observed in many selected lines. However, these gains were generally less than the predicted gains.

5558 CRITTENDEN, H. W., SPRINGER, F. B. (JUN.) & COLE, R. H.
New Bethel soybean resists nematode.
Crops & Soils 1961 : **13** : No. **6** : p. 20.

[Cf. 4029].

5559 ŠIMANSKIJ, N. K.
[**The new soya-bean variety Pionerka. (A brief description)**].
Nauč. Trud. selekc.-genet. Inst. Lysenko (Sci. Trans. Lysenko Breed. Genet. Inst.), Odessa 1958 : No. 3 : 158–60. [Russian].

Pionerka [Pioneer] was selected in Odessa. It is earlier and more productive than VNIIMK 9186 [Oil Plants Institute 9186] and has a habit suitable for combine harvesting.

5560 NAGATA, T.
Agronomic studies on the genecological differentiation of soybeans in Japan and the world.
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1960 : **4** : 96–122.

Studies on the effects of different planting dates on flowering and fruiting in summer and autumn soya bean varieties are reported. Parallel trials conducted in Japan and the USA on Japanese, American and Manchurian strains are discussed, and the various types are evaluated for suitability for various regions in the two countries. The agronomic characters of types with indeterminate growth habit are considered in some detail.

5561 KIYOSAWA, S. & KIYOSAWA, K.
Varietal differences of response to light-interruption and of minimum number of short day cycles required for flowering.
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 359–61.

Short-day treatment promoted flowering in all of the four soya-bean varieties tested. When the dark period was interrupted by light periods of up to 10 min., it was found that an interruption of only 1 min. was sufficient to reduce the short-day effect considerably in the late varieties Kyushu 5 and Yukikorogashi. In the mid-season varieties, Katazaya and Anu, however, a 10 min. interruption had only a small effect. While 1–2 short-day cycles were sufficient to stimulate flowering in the last two varieties, the first two required 4 or more cycles.

5562 HANSON, W. D., LEFFEL, R. C. & HOWELL, R. W.
Genetic analysis of energy production in the soybean.
Crop Sci. 1961 : **1** : 121–26.

"The caloric values and the weight of initial sugar carbons required to produce a fraction were developed for each of the soybean seed fractions. The caloric measurement scale led to agronomic evaluations but was considered inadequate for a complete genetic analysis. The latter measure permitted a transformation (ϕ_i) expressing the proportion of the initial sugar carbons associated with each seed fraction. With the assumption that a genotype has unique capacity to produce initial sugar energy, interpretable concepts of protein, oil, and residual synthesis resulted.

"A statistic, relative genetic sensitivity, was developed to compare two measurement scales as selection criteria.

"Energy per acre based on the seed fractions or upon total energy was essentially as efficient a selection criterion as yield. The selection for high yield was essentially identical genetically with the selection for total energy per acre.

"Genotypes differ in the ability to convert the residual fraction to oil or protein. Within highly selected lines, however, the genetic variability in the residual was found to be restricted as compared with the genetic variability for oil and protein. Thus, the genetic correlation between protein and oil was high

(—·852) as measured on the proportionate (p_i) scale.

"The scale change for protein to oil percentages was calculated as 1·92 for random deviates and between 1·45 and 1·92 for changes on the genetic scale, based on the concept of carbon equivalents. The grain in percent protein for each loss of 1% oil in a breeding program for high protein would be less than 2%, perhaps in the range of 1·5–1·6%, but for a constant energy potential yield should be increased. Experimental estimates for the scale change were comparable to the theoretical values.

"The average genetic correlation between percent protein and yield estimated from the data was negative but essentially zero, although this may vary with environments.

"One would expect the genetic correlations between percent protein and yield to be small and positive. Since approximately ·79, 1·14, and ·40 grams of sugar carbon were required to produce one gram of protein, oil, and residual, respectively, there should be no restrictions in producing a high yielding, low oil bean and, if nitrogen is not limiting or other physiological restrictions are not present, a high yielding, high protein bean."

[Authors' summary].

5563 KITANI, K., INOUE, Y. & NATSUME, T.
(Studies on soya-bean rust and its control. II. Studies on the control of soya-bean rust).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 343–58. [Japanese].

This investigation included a survey of relative varietal susceptibility to the above pathogen. Two varieties, Iyo and Aso 1, were completely resistant.

5564 NAGATA, T.
Interrelation of the effects of day-length on the period to flowering, flowering period, and seed forming period, with special regards to the relative flowering period and the relative growing period of soybeans.
Ikushugaku Zasshi/Jap. J. Breeding 1960 : **10** : 188–94.

A report is given on experiments carried out at the Hyogo Agricultural College, Japan, elucidating (1) varietal differences in the above three periods in relation to photoperiod and (2) the relationships between determinate *v.* indeterminate habit and seed size under natural day-length conditions in the field.

5565 NAGATA, T.
Studies on the differentiation of soybeans in the world, with special regard to that in the southeast Asia. 3. Some photoperiodic aspects of the nature of the tropical soybeans.
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1961 : **29** : 267–72.

In a study of many varieties, mostly from Asiatic countries, at the Hyogo Agricultural College, the tropical type had the shortest critical day length for flowering (13–14 hours). With a day length of 12 hours, varieties from the tropics and subtropics had a longer period from sowing to flowering and longer stems than varieties from temperate regions. Tropical and subtropical varieties usually had the indeterminate habit, which is considered to be of primary importance in adaptability to the short days under tropical conditions. The long period from sowing to flowering characteristic of the tropical type is believed to be the result of secondary differentiation in response to sowing time during dissemination of the crop from China to the tropics. [Cf. XXX, 3330].

5566 NAGATA, T.
Studies on the significance of the indeterminate growth habit in breeding soybeans. I. Properties of American soybeans attributable to their indeterminate growth habits.
Ikushugaku Zasshi/Jap. J. Breeding 1961 : **11** : 24–28.

It is pointed out that at present the indeterminate type is cultivated in Japan only for green manure. Tests carried out with 56 varieties from the USA during 1954 and 1955 at the Hyogo Agricultural College indicated that maturity groups O–II, III–V and VI–VIII in the American classification respectively corresponded to the summer, intermediate and autumn types grown in Japan. The group of American varieties used primarily for oil production consisted mainly of types with indeterminate habit and early or medium maturity and types with determinate growth and late maturity. The forage group comprised only indeterminate varieties, with medium or late maturity, and the vegetable group only determinate varieties, with early, medium or late maturity. Consideration of the native countries of origin of the American varieties or their ancestors agreed with the author's view of the genecological differentiation of the soya bean throughout the world [cf. 2754].

5567 LAMPRECHT, H.
Ein neues monogen bedingtes Merkmal bei *Pisum*: Purpurviolette Streifung der Hülsen. (**A new monogenically determined character in *Pisum*: purple-violet pod striation**).
Agri hort. genet., Landskrona 1961 : **19** : 241–44.

A dominant gene, *Astr* (*astriatus*), causing bluish purple longitudinal striations on the pods, has been detected in *P. arvense* oect. *fulvum*.

5568 LAMPRECHT, H.
Weitere Studien zur Genenkarte von Chromosom I von *Pisum* sowie andere Koppelungsergebnisse. (**Further studies on the gene map of chromosome I of *Pisum* and also other results of linkage**).
Agri hort. genet., Landskrona 1961 : **19** : 225–40.

Data from four crosses, together with the results of earlier work, give the following order for the 19 known genes of chromosome I: *A*-Vi_1*-Y-Au-Miv-Lf-D-Re-Pur-Fom-Lac-Cor-Am-O-Sp-Sal-I-Red-Gri*. The following linkages were also demonstrated: chromosome II, *S-Wb-K-Pal*; chromosome III, *M-F-St-B*; chromosome IV, *N-Tra-Br-Le*; and chromosome V, *Cp-Gp-Te-Ust*.

5569 LAMPRECHT, H.
Über die verschiedene Struktur von Chromosom V von *Pisum* sowie Allgemeines zum genanalytischen und zytologischen Nachweis verschiedener Strukturtypen. (**On the varying structure of chromosome V of *Pisum*, and general observations on the gene-analytical and cytological demonstration of different structural types**).

Agri hort. genet., Landskrona 1961 : **19** : 245–68.

Further work [cf. XXX, 4459 and 4463] indicates that the normal order of the 14 known genes is *-Cp-Teu-Gp-Cri-Cr-Te-Com-Cal-Laf-Snl-Ce-Fs-U-Ch-*. In addition, one V/I, one V/III and two V/VII reciprocal translocations are known, also a double reciprocal translocation, V/III/IV, and the inversion of *Cp-Teu-Gp* to *Gp-Teu-Cp*.

5570 LAMPRECHT, H.
Ein neues Gen für lokale Färbung der Testa von *Pisum*-Samen und seine Koppelung, sowie weitere Koppelungsstudien, insbesondere im Chromosom V. (**A new gene for the local coloration of the testa of *Pisum* seeds and its linkage, together with further linkage studies, particularly in chromosome V**).
Agri hort. genet., Landskrona 1961 : **19** : 197–212.

The new gene *ray* causes grey coloration of the part of the testa overlying the radicle in the homozygous state but results in little or no colour when heterozygous. Data on the behaviour of *ray* and 20 other genes, obtained from two crosses, show that *ray* lies near the right end of chromosome III, probably linked in the order *-C-B-Gl-Ray*. The data also provide evidence of the existence of two structural forms of chromosome V, one with the sequence *Cp-Gp-Te* and the other with *Gp-Teu-Cp*. *Te* and *Teu* have a similar effect upon pod width and may be polymeric genes showing a position effect.

5571 LAMPRECHT, H.
Eine neue Testafarbe von *Pisum*-Samen: *salmoneus*. (**A new testa colour of *Pisum* seeds: *salmoneus***).
Agri hort. genet., Landskrona 1961 : **19** : 213–22.

Data from three crosses have revealed the occurrence of the gene *sal*, which in the homozygous condition gives a pinkish cinnamon or pinkish buff tint to the testa, the intensity depending upon environmental conditions; coloration is slight in the heterozygous condition. The gene sequences *A-D-Sal-I-Gri* in chromosome I and *Cp-Gp-Te-Ust* in chromosome *V* were demonstrated.

5572 LAMPRECHT, H.
Pisum fulvum Sibth. & Sm. Genanalytische Studien zur Artberechtigung. (***P. fulvum* Sibth & Sm. Gene-analysis studies on its status as a species**).
Agri hort. genet., Landskrona 1961 : **19** : 269–97.

On the basis of dried material and published descriptions, the only constant specific character of *P. fulvum* appears to be the yellow or ochraceous flower colour; in addition, *Astr* [cf. 5567] and *Umb*, determining brown testa colour, have been identified. In crosses of line

1256 of *P. fulvum* from Asia Minor with four *P. arvense* lines, *P. arvense* as female parent gave more pods and more and larger seeds than *P. fulvum*, but both had similar values for ovules per pod and seed set per ovule, the latter value being about 12·5%. The fertility, the lowness of which is attributed to differences in chromosome structure, increases in later generations. Segregation for flower colour yielded complex results, but it appears that the ochraceous colour of *P. fulvum* is conditioned by the complementary action of *Cit* and *Cm*. Since all combinations of all segregating genes studied were found in the progenies, it is concluded that none of these genes can be considered specific to *P. fulvum* [cf. XXX, 1107]. This species is therefore regarded as only an ecotype of *P. arvense*.

5573 Borg, Å. & Bingefors, S.
Svalöfs Belloärt—ny foderärtsort för södra och mellersta Sverige. (**The Svalöf pea Bello—a new fodder pea for southern and central Sweden**).
Sverig. Utsädesfören. Tidskr. 1961 : **71** : 41–52.

An extended account of the pedigree and performance of Bello is presented [cf. XXVIII, 2384].

5574 **Seed bulletin. Peas.**
IVRO, Wageningen 1961 : Pp. 7.

Notes and tables on the characters and performance of eight blue peas and three marrowfats admitted to the Netherlands Descriptive List of Varieties of Field Crops [cf. 4069] are given. The newly approved variety WPH 333, from Servo x Stijfstro [Stiff Straw], has large, well-shaped seeds of good colour, yields well, has very stiff stems and is resistant to yellowing.

5575 Kennelly, A. G.
Peas.
NZ J. Agric. 1961 : **102** : 357, 359, 361, 363.

Brief descriptions are given of ten commercially cultivated pea varieties, namely Little Marvel, William Massey, Greenfeast, Victory Freezer, Onward, Stratagem, Wyola, Canner 75, Twenty Nine and Dark Skinned Perfection.

5576 Lučnik, N. V. & Carapkin, L. S.
(**The influence of cysteine on the cytological damage induced in peas by γ irradiation**).
Citologija (Cytology) 1959 : **1** : 71–77. [Russian].

When γ-irradiated tissues of *Pisum sativum* were placed in a 0·01M cysteine solution, a significant reduction in the number of chromosome aberrations was noted, as compared with similarly irradiated tissues placed in water. Various hypotheses accounting for the protective effect of cysteine and other sulphydryl compounds are discussed.

5577 Roux, A.
Die Schwankungen der Wuchshöhe bei Gemüseerbsen (Pal- und Markerbsen) im 5jährigen Mittel (1955–1959). [**Variations of the height of growth in vegetable peas (shelling and marrowfat peas) in a five-year average (1955–1959)**].
Züchter 1961 : **31** : 4–6.

Data assembled for 59 varieties showed that height is a varietal character; it varied between 165 cm. for Alderman and 50 cm. for Schreibers Delisa. Height was greatly influenced by weather and other environmental conditions.

5578 Woyke, H.
Wpływ temperatury na przebieg pęcznienia i kiełkowania grochów gładkich i pomarszczonych oraz wrażliwość tych dwóch typów odmian grochów na przymrozki. (**The influence of temperature on the process of swelling and germination of smooth and wrinkled peas and the susceptibility of these two types of pea varieties to frost**).
Roczn. Nauk rol. : Ser. A. 1961 : **83** : 619–39.

Studies were made at Skierniewice, Poland, on six varieties with smooth seeds (S) and seven with wrinkled seeds (W). Imbibition was about 100% of the initial weight for S seeds and about 150% for W seeds. S seeds completed imbibition more rapidly, had a higher germination energy and capacity, showed a lower decrease in germination at temperatures above and below the optimum (20° C.) and were less susceptible to rotting than W seeds. S seedlings were more susceptible to frost damage at —2° and —5° C. and were found to have a lower content of dry matter. No differences in content of monosaccharides, disaccharides or total sugars were detected between the two types.

5579 Ajzenštat, Ja. S.
(**Effect of the quantity of pollen on the behaviour of hybrid progeny**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1960 : No. 5 : 50–59. [Russian].

Information obtained from a series of intervarietal pea crosses confirmed the results of earlier work, using peas, tomatoes and wheat, on the effects of restricted pollination [cf. XXIV, 757]. A number of pea crosses are described in which pollination with only 10–15 pollen grains gave rise to F_1 plants bearing predominantly seeds of the maternal type, whereas pollination with unlimited quantities of pollen gave normal Mendelian segregation. In other crosses limited pollination gave F_1 plants with an excess of seed of the maternal type. In certain crosses maternal inheritance was observed in some characters while in others, segregation occurred on Mendelian lines, and in still others, Mendelian segregation occurred in the control but with limited pollination the ratios were reversed, there being an excess of recessives.

A detailed analysis is presented for one of the crosses, Lincoln x Mahndorf Viktoria; the ratio of smooth : wrinkled seeds was 1 : 7·3. The possibility that this could have been brought about by selfing is ruled out by the fact that several families segregated for seed type or plant habit and others differed from the seed parent in the height of the first pod and hence time of maturity. The differences were repeated in later generations.

These results are interpreted as demonstrating the role of other parts of the pollen grain than the generative nucleus in normal fertilization. The possibility of preserving the maternal type while adding certain isolated characteristics such as earliness may, it is suggested, be useful in plant breeding.

5580 Lockwood, J. L.

Progress and problems in breeding peas resistant to root rots.

Quart. Bull. Mich. agric. Exp. Sta. 1960 : **43** : 358–66.

The results of evaluating introductions for reaction to *Aphanomyces euteiches* and *Fusarium* (*Hypomyces*) *solani* f. *pisi* are surveyed [cf. 1096–97]. As already reported, only low degrees of resistance were found in seedling tests in the greenhouse, particularly in the case of the first pathogen. Breeding for resistance to both diseases was initiated in 1957, using introductions which had shown most resistance in these tests. In breeding for resistance to *A. euteiches*, the introductions chiefly used were PI166159, PI167250, PI180693 and a selection of PI169604, the commercial parents being the canning types Alaska and Perfection and freezing type Green-seeded Perfection. With inbreeding and selection of crosses between resistant and commercial parents to the F_5–F_8, uniform lines with dwarf, intermediate or tall growth, green wrinkled seeds and a degree of resistance equal to that of the resistant parent have been developed, selection for resistance having been effected in the greenhouse. Some of the inbreds have been back crossed for three to four generations to commercial varieties. No enhancement of resistance has so far been attained by crossing resistant parents. Breeding for resistance to *Fusarium* root rot proceeded along similar lines. The introductions most often used as sources of resistance were PI138945, PI140165 and PI174918. Some F_4–F_6 lines appear to be uniform for a degree of resistance equal to that of the resistant parent; back crossing to commercial types was initiated during winter 1959–60. Breeding to combine resistance to both root rots in single lines has also been undertaken.

Inheritance of the resistance of PI140165 to *Fusarium* root rot was studied in crosses with Early Perfection. Resistance was dominant and possibly dependent upon several genes. It remains to be determined whether the degrees of resistance to the two pathogens are sufficiently high to be expressed under field conditions. Several approaches to the problem of securing higher levels of resistance are being explored: (1) continued evaluation of introductions, (2) continued work on crossing different sources of resistance, (3) induction of resistant variants by mutagenic agents such as ionizing radiation and (4) crossing *Pisum sativum* with introductions of other genera resistant to *A. euteiches*. Preliminary attempts to cross commercial pea varieties with a *Lathyrus* accession highly resistant to *Aphanomyces* root rot were unsuccessful. Other problems of breeding for resistance to the root-rot complex are (*a*) the probability that other fungi, such as *Thielaviopsis basicola*, are involved, and (*b*) the possible occurrence of physiological races of the pathogens.

5581 Tuveson, R. W. & Garber, E. D.

Genetics of phytopathogenic fungi. IV. Experimentally induced alterations in nuclear ratios of heterocaryons of *Fusarium oxysporum* f. *pisi*.

Genetics 1961 : **46** : 485–92.

Two of ten heterocaryons involving diauxotrophic mutants each yielded spores with nuclei from one or the other of the components, one spore type greatly outnumbering the other. Seven of the heterocaryons gave rise to spores with nuclei from only one of the components. The tenth heterocaryon yielded prototrophic spores which were presumably heterozygous diploids. When this heterocaryon was made a second time, it produced, in almost equal numbers, spores with nuclei of one or the other of the components. Four of the second category of seven heterocaryons were grown on a minimal medium supplemented with graded concentrations of the compounds required by the "minority" component. In three out of four cases, the nuclear ratios were altered by supplementation, but the frequency of the "minority" nucleus in the spores was not necessarily directly related to the concentration of the appropriate compounds. [Cf. 2775].

5582 TSUCHIYAMA, T., OYAMA, M. & NAGAOKA, N.
(Analytical studies of the damage caused by *Bruchus pisorum*).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1960 : **5** : 359–80. [Japanese].

The relative susceptibility of some Japanese and introduced pea varieties to the above pest was ascertained. Resistance was correlated with early maturation and thin foliage.

5583 DANILEJK, A. V.
(Studies on the resistance of different pea varieties to *Bruchus pisorum*).
Agrobiologija (Agrobiology) 1960 : No. 2 : 306–07. [Russian].

Resistance has been positively correlated with the following morphological characteristics at the Kuban' Agricultural Institute: short or medium height of plant, leafiness, firm stem, large stipules, long pod, short stalk and marrowfat type of seed. Varieties with less than 3% injury included the early variety Vystavka [Exhibition], midseason Vyzov Karlikovyj [Dwarf Challenge] and late Gladstone. In the varieties which did not possess the above morphological characteristics the percentage of seed attacked by *Bruchus* varied between 24 and 38.

5584 MÁNDY, GY. & KARKOVSZKY, G.
Csemegekukorica-fajták összehasonlító alaktani és fejlődésélettani vizsgálata.
(A comparative study on the morphology and developmental physiology of sweet corn varieties).
Agrobotanika, Tápiószele 1959 : **1** : 106–61. (Mimeographed).

Data are given on the variation in morphological characters and the performance at Tápiószele, Hungary, of 17 varieties. It is suggested that the convar. *saccharata* may be subdivided into two cultigrexes, cg. *dulciforme*, with raisin-shaped grains, and cg. *saccharodens*, with dent grains.

5585 SINGLETON, W. R.
Blandy sweetcorn available.
Crops & Soils 1961 : **13** : No. **7** : p. 23.

Developed at the Blandy Experiment Farm of the University of Virginia, Blandy (B1 55 x B1 90) is a very late hybrid with high quality and resistance to *Heliothis armigera.* Inbred B1 90 is a selection of Connecticut 90, whose parentage is given as a white Stowall inbred 77 x Charlevoix. Inbred B1 55 is a selection of Ohio 55.

5586 KERR, E. A.
Note on selecting sweet corn for eating quality in early generations of inbreeding.
Canad. J. Pl. Sci. 1961 : **41** : 438–39.

In the standard procedure of selection during inbreeding, no attention is paid to edible quality until the S_4 and S_5, when the lines have become fairly well stabilized and the chances of securing outstandingly high quality are very slight. At the Vineland Station, Ont., selection for edible quality has been introduced into the standard procedure, by tasting the raw ears while still on the plants, beginning with the S_2. F_1 hybrids involving inbreds developed by this modified method have been under test for three years and are outstanding in edible quality. Kernel decay in the region of the bite does not as a rule extend to the uninjured kernels. Inbreds developed by this method are so tender and high in sugar that greater care than usual must be taken to select for resistance to ear rots and for ability to germinate rapidly in cold soils.

5587 THOMAS, W. I. & GRISSOM, D. B.
Cycle evaluation of reciprocal recurrent selection for popping volume, grain yield, and resistance to root lodging in popcorn.
Crop Sci. 1961 : **1** : 197–200.

Reciprocal recurrent selection was effective in simultaneously improving the yield, popping volume and lodging resistance means of the two populations studied; there appears to be sufficient variability to permit further advances. While almost equal gains were made in a parallel programme of direct selfing, the possibility of further gains in this material appears to be limited by homozygosity.

5588 Kolpakova, O. I.
(The first results of studies with medicinal peppermint in Apšeron).
Izv. Akad. Nauk Azerbajdž. SSR : Ser. biol. sel'skohozjajstv. Nauk (News Acad. Sci. Azerbaijan SSR : Ser. biol. agric. Sci.) 1959 : No. 6 : 59–63 : from Ref. Ž. (Ref. J.) 1961 : No. 3 : Abst. 3G798 : p. 73. [Russian].

Forms selected for vigour, leafiness, large leaf, menthol content and resistance to drought and wind from several varieties at Apšeron are described.

5589 Ikeda, N., Shimizu, S. & Udo, S.
[Studies on artificial tetraploids and triploids of *Mentha rotundifolia* (L.) Huds.].
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1960 : No. 15 : 1–9. [Japanese].

Descriptions are given of the colchicine-induced tetraploid and of triploids obtained by the 4*x* x 2*x* cross. Both polyploids show an increase in rotundifolone content in comparison with the diploid. The modal meiotic configurations of the 4*x* and 3*x* strains are respectively 24_{II} and $12_{II} + 12_{I}$.

5590 Zolotovič, G.
(A colour spot test for peppermint oil for peppermint breeding).
CR Acad. bulg. Sci. 1960 : **13** : 343–46 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 4 : Abst. 816 : p. 40. [French]. (Mimeographed).

When a drop of the reagent (1 vol. concentrated nitric acid + 200 vol. glacial acetic acid) is added to a drop of peppermint oil, the menthofuran present gives a blue coloration. This reaction can be used to determine the peppermint-oil content of hybrid plants.

5591 Murray, M. J.
Spearmint rust resistance and immunity in the genus *Mentha*.
Crop Sci. 1961 : **1** : 175–79.

Resistance to *Puccinia menthae* was conditioned by a single dominant gene *S*. Interspecific hybridization studies showed that *M. aquatica*, *M. citrata* and *M. piperita* were homozygous for the dominant allele and immune to the pathogen. The strain of *M. crispa* used here was also immune but was heterozygous for the resistance gene. *M. arvensis*, *M. arvensis* var. *piperascens*, *M. cardiaca*, *M. spicata*, *M. niliaca*, *M. rotundifolia* and *M. gentilis* were all homozygous for the recessive allele but varied widely in degree of susceptibility, indicating that polygenes may be involved; strains of *M. spicata* varied from extremely susceptible to extremely resistant. The genetic constitution of rust-immune *M. longifolia* was not established; it is suggested that immunity in this species may be conferred by a quite different, recessive gene since hybrids between *M. longifolia* and susceptible species were predominantly susceptible. Rust was observed on one out of four strains of *M. pulegium* examined, but the genetic basis was not determined.

5592 Berry, S. Z. & Thomas, C. A.
Influence of soil temperature, isolates, and method of inoculation on resistance of mint to *Verticillium* wilt.
Phytopathology 1961 : **51** : 169–74.

A detailed account is given of investigations which have already been briefly reported [1109].

5593 Wakankar, S. M. & Nigam, B. G.
If it's coriander, make it 5365.
Indian Fmg. 1961 : **10** : No. 11 : p. 17.

Coriander 5365, a small-seeded variety resistant to *Fusarium oxysporum* f. *coriandri*, has been developed by selection at the Agricultural Research Institute, Gwalior, Madhya Pradesh.

ECONOMIC LOWER PLANTS

5594 Karasevič, Ju. N.
(Conference on experimental production of useful variants of microorganisms).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. 3 : 470–72. [Russian].

Several speakers referred to the production of useful strains by hybridization, by irradiation and the use of chemical mutagens while others spoke in favour of the production of adaptations. Among the achievements of selection, yeasts resistant to low temperatures, or high alcohol concentrations, and strains of *Aspergillus niger* producing high yields of citric acid were mentioned.

5595 Dzjan', D.
(The breakdown of cellulose by *Actinomyces*).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1960 : No. 1 : 132–37. [Russian].

A number of strains breaking down cellulose have been selected from different soils in the USSR. Strains of *Actinomyces* (*Streptomyces*) *albus* and *A.* (*S.*) *aurantiacus* were the most active in this respect.

5596 SUN, H.-J.
(Phosphorus metabolism of the *Aspergillus niger* T–1 variant obtained by ultraviolet radiation. III. The metabolic role of phosphatase).
Mikrobiologija (Microbiology), Moskva 1960 : **29** : 806–12. [Russian].

The mutant had a higher phosphatase activity in a nutrient medium and in sugar solution than the initial strain. The addition of phosphorus to the sugar solution reduced the yield of citric acid by the mutant, increased growth and sharply reduced phosphatase activity.

5597 LOGINOVA, L. G.
(The activity of some oxidizing enzymes in the *Aspergillus nidulans* variant obtained by ultraviolet radiation).
Mikrobiologija (Microbiology), Moskva 1960 : **29** : 839–42. [Russian].

A comparative study of the initial strain and the mutant showed that the latter had greatly reduced catalase activity and slightly decreased activity of peroxidase, polyphenoloxidase and ascorbic oxidase.

5598 ALIHANJAN, S. I., KAMENEVA, S. V. & KRYLOV, V. N.
(Experimental increase in the frequency of diploidization of nuclei in the mycelium of heterocaryons of *Penicillium janchewskii*).
Mikrobiologija (Microbiology), Moskva 1960 : **29** : 820–25. [Russian].

The exposure of the heterocaryon to 36° C. at the spore-formation stage greatly increased the diploidization frequency. The method is recommended for the induction of diploidy.

5599 GOLENIA, A., PAWEŁCZYK, E., SPEICHERT, H. & TYBORSKA, B.
Dotychczasowe rezultaty porównawczej hodowli różnych ras grzyba *Claviceps purpurea* w ciągu kilku lat. **(The results to date of comparative breeding of different races of the fungus *C. purpurea* over a period of several years).**
Biul. Inst. Roślin Leczn. 1961 : **7** : 33–43.

The morphological characters and alkaloid composition of 17 strains cultured saprophytically or parasitically over a number of years at the Polish Institute of Pharmaceutical Plant Breeding proved to be fairly stable, but alkaloid content varied according to climatic conditions.

5600 OPPENOORTH, W. F. F.
New possibilities in yeast breeding.
Wallerstein Labs. Commun. 1961 : **24** : 29–45.

The DNA extract from a strain of *Saccharomyces chevalieri* was dissolved in unhopped Pilsener wort which was then used as the culture medium for two recessive yeasts with good sporulation and spore viability. Transformation, as indicated by permanent changes in fermentative capacities, was induced in the recessive strains by the ingested DNA. Data on segregation revealed that this DNA had been localized exclusively in the nucleus and that each gene in the complex represented by the donor DNA could be transferred separately. "Pseudotransformation" conferred fermentative abilities which were lost after several transfers to sugar broth. This phenomenon is attributed to the temporary effect of donor RNA, present as an impurity in the DNA extract. The results are interpreted in terms of current concepts of chromosome biochemistry and attention is drawn to the possible significance of transformation as a new approach in yeast breeding.

5601 OPPENOORTH, W. F. F.
Modification of the hereditary character of yeast by ingestion of cell-free extracts.
Leeuwenhoek ned. Tijdschr. 1960 : **26** : 129–68.

DNA extracts from *Saccharomyces carlsbergensis* (which sporulates poorly) conferred the ability to ferment certain sugars on R_7, a freely-sporulating strain of complex parentage. The transformed cells, however, sporulated poorly so that a systematic study of their genetic constitution could not be made. Freely-sporulating, transformed cells of K_{83} S_{58} were obtained when *S. chevalieri* was used as DNA donor. The induced transformations were generally permanent but, in some cases, pseudotransformations were induced in which the acquired fermenting ability gradually disappeared; it is suggested that pseudotransformations may be induced by RNA. The transformed cells crossed readily with the original strain.

5602 SARACHEK, A. & FOWLER, G. L.
Induction of heritable respiratory deficiency in *Saccharomyces* by pantothenate starvation.
Nature, Lond. 1961 : **190** : 792–94.

The test organism used in these investigations at the Department of Biology, University of Wichita, Kans., was a tetraploid strain of

Saccharomyces with a partial requirement for pantothenate under both aerobic and anaerobic conditions. Respiration-deficient mutants of spontaneous origin were known to occur in this strain with a frequency of about 0·3%. Through the early and middle portions of the logarithmic periods of growth, the frequencies of respiratory variants were maintained at the spontaneous levels in all cultures. During the period of transition from the logarithmic into the stationary phase, however, cells cultured aerobically in absence of pantothenate were converted *en masse* into respiration-deficient mutants. No such change occurred in either the pantothenate-supplemented culture or in anaerobic cultures with or without pantothenate. To determine what bearing lipid metabolism might have on this mutation, potassium acetate as well as representative sterols and higher saturated and unsaturated fatty acids were tested individually for effects on the composition of early stationary-phase populations attained in pantothenate-free aerobic cultures. Only potassium acetate and oleic acid appeared to be highly effective in preventing respiratory mutation. Stearic and palmitic acids were considerably less effective, while linoleic acid, ergosterol and cholesterol were without effect. It is concluded that the heritable loss of respiratory competence induced by pantothenate starvation under aerobic conditions is attributable to disturbance in mitochondrial organization, due to a cellular deficiency of particular fatty acids.

5603 Renaud, J.
Étude de mutants apparus sur la colonie géante d'une race de levure isolée du vin. **(A study of mutants occurring in the giant colony of a yeast strain isolated from wine).**
CR Acad. Sci., Paris 1961 : **252** : 3321–23.

Spontaneous *Saccharomyces* mutants were distinguishable from the wild type on the basis of morphological characteristics, while sugar-fermentation properties were unchanged.

5604 Kosikov, K. V., Bočarov, S. N. & Lysunkina, E. I.
(Dependence of the frequency of directed hereditary changes and the rate of reproduction of yeasts on the temperature of culture).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 95–98. [Russian].

When a single-spore culture of *Saccharomyces globosus* was cultured in a medium containing 26% of sucrose a certain number of variants capable of fermenting this sugar occurred; their proportion varied according to the temperature, being significantly higher at 40° C. than at 23° C., though the rate of cell division was almost identical at the two temperatures.

5605 Kosikov, K. V. & Raevskaja, O. G.
(Possibility of accelerating and retarding directed hereditary change in fermenting properties of yeasts).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 99–107. [Russian].

When a single-spore culture of *Saccharomyces globosus* not capable of fermenting sucrose was cultured in a medium containing 1% of sucrose only 1 out of 237 cultures produced variants capable of fermenting sucrose, but when the medium contained 20% of sucrose 36 cultures out of 249 produced fermenters. In further experiments a range of sucrose solutions from 2 to 66% was taken. The frequency of fermenting cultures rose with increasing sucrose concentration to a maximum at 34%, after which it declined, reaching zero at 58%. The degree of adaptation was reduced by the addition of maltose or lactose while maintaining the osmotic pressure unchanged.

Cultures obtained from 46 asci from adapted strains were studied; 44 of them segregated into 2 fermenting : 2 nonfermenting, one segregated 3 : 1 and one 1 : 3. The acquired fermenting capacity is interpreted as a directed hereditary change.

5606 Kosikov, K. V. & Tsai, C.-K. [T.-K].
(Directed change of fermenting properties in some yeast strains in media with high and low concentrations of specific substrates).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1960 : No. 27 : 108–19. [Russian].

Four strains of *Saccharomyces globosus*, each arising from one ascospore of the same ascus, all incapable of fermenting sucrose or maltose, were cultured in media containing 6% and 34% of sucrose. In the latter medium two of the strains produced variants capable of fermenting sucrose in 69 and 48% of the cultures respectively whereas the other two strains produced only 4 and 13% respectively. Very few fermenting variants were produced in the 6% solution by the first two strains and none by the last two.

Asci from the adapted cultures were germinated individually; 131 of them gave rise to fermenting and nonfermenting cultures in the ratio of 2 : 2, one gave 3 : 1, 78 gave 1 : 3 and 8 gave 1 fermenting : 1 nonfermenting : 2 inviable.

The fermenting strains produced in the high concentrations of sucrose had higher rates of cell reproduction than those produced in the low concentrations but their rate of fermentation was lower.

5607 Yuasa, A.
The spindle of yeast-cell.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1960 : **73** : 474–78.

A number of different methods of fixing and staining cells of *Saccharomyces cerevisiae* were tested. The most effective method for the preparation of nuclear contents consisted of treatment with cell-wall lytic enzyme, fixation with Carnoy's fluid, hydrolysis with 1N HCl followed by staining with acetocarmine or Giemsa's solution. For study of the spindle, the optimum treatment consisted of fixation with a 1% cadmium chloride solution. Vacuolar contents were satisfactorily fixed through the use of either Carnoy's fluid, Flemming's solution or 45% acetic acid. The sequence of events in yeast-cell mitosis is described briefly.

5608 James, A. P. & Müller, I.
Radiation-induced mitotic stimulation.
Radiation Res. 1961 : **14** : 779–88.

Mitosis was stimulated in cells of *Saccharomyces cerevisiae* by ultraviolet light (200 ergs per mm.^{2}) and X irradiation (500 r.). The mean generation time in treated cultures was decreased by as much as 14% over a period of three generations. It was demonstrated that although the stimulus was transmitted to successive cells, it did not result from mutagenesis.

5609 Cox, B. S.
Aneuploidy in yeast.
Heredity 1960 : **15** : p. 453. (Abst.).

"In 1958, Bevan [XXIX, 2137] reported that a strain of yeast, heterozygous for an adenine requirement which confers a red colour when present in the homozygous condition, produced many colonies with red sectors when it was plated on complete nutrient agar. It has been possible to demonstrate, through the existence of partial heterozygosity in the haploid offspring, that this diploid was a tetrasomic of constitution 2n + 2 = AD/ad/ad/ad1. It has been shown that the frequency of sectoring of this and other aneuploids can be very much higher than that of normal heterozygous diploids, but that the frequency varies between one aneuploid and another, and even between different sub-cultures of the same aneuploid strain. It is suggested that fluctuations in the chromosome complement are responsible both for the appearance of the red sectors themselves and also for some of the variation in the frequency with which they appear. Experiments are also described which suggest that some of this variation may be due to cytoplasmic factors."

5610 Williamson, D. H. & Scopes, A. W.
The behaviour of nucleic acids in synchronously dividing cultures of *Saccharomyces cerevisiae.*
Exp. Cell Res. 1960 : **20** : 338–49.

"When inoculated into a synthetic medium, cells of *Saccharomyces cerevisiae* which had previously been subjected to repeated suspension alternately in two different media, were found to divide with a marked degree of synchrony. The first buds appeared after a lag period of about 60 minutes, during which no nucleic acids were synthesised. Budding was accompanied by the start of RNA synthesis and was closely followed by an abrupt doubling of the cell content of DNA. As the buds grew, the amount of DNA remained constant, while synthesis of RNA continued at a steady rate and only ceased at or just before cleavage of the mother and daughter cells. Buds were formed almost immediately after cleavage, and their appearance was closely followed by a further doubling of DNA. Synthesis of RNA however was not resumed until about 80 minutes after cleavage, but once started it continued steadily throughout the rest of the cycle. The significance of these observations is discussed."
[Authors' summary].

5611 Ilinca, P.
Selecţionarea şi folosirea drojdiilor în vinificaţie pe podgorii. (**The selection and use of yeasts in wine-making in the vineyards**).
Lucrăr. şti. centr. exp. Îngrăşăminte bact. 1960 : **2** : 327–35.

Improvements in alcohol content and wine quality are reported from the use of selected Rumanian yeast strains.

5612 Ilinca, P.
Selecţionarea de drojdii de pe prune şi folosirea lor la fermentarea prunelor pentru tuică. (**The selection of plum yeasts and their use in fermenting plums for plum brandy**).
Lucrăr. şti. centr. exp. Îngrăşăminte bact. 1960 : **2** : 347–55.

Fourteen yeast strains have been selected which have given improved alcohol yields in fermented plum musts and improved quality of the brandy distilled from these.

5613 IGUTI [IGUCHI], S.
Effects of monochromatic ultra-violet rays on yeast cells. VI. A mutant of yeast with an alternative requirement for valine and leucine.
Sci. Rep. Tôhoku Univ. : 4th. ser. (Biol.) 1960 : **26** : 247–57.

Among the variants produced by subjecting *Torula rubra* to monochromatic ultraviolet light was a valine-requiring mutant, 2616; Ca-pantothenate supported suboptimal growth. The valine requirement was not specific since leucine or isoleucine could be substituted in combination with Ca-pantothenate.

5614 HUGHES, D. T.
Chromosomes of the wild mushroom.
Nature, Lond. 1961 : **190** : 285–86.

Using a squash technique to ensure that entire cells were being examined, it was found that *Agaricus campestris* var. *tetrasporus* has $n = 12$. Also employing a squash technique, Evans reported $n = 12$ for the cultivated mushroom [XXVII, 1185]. The failure of the wild and cultivated forms to hybridize does not therefore depend on a difference in chromosome number. An incompatibility system and disparity in the breeding system may be involved.

BOOK REVIEWS

5615 KRISHNASWAMY, N. & CHANDRASEKHARAN, S. N.
Cytogenetics and plant breeding.
P. Varadachary & Co., Madras : 1960 : 2nd Ed. : Rs. 25 : Pp. xv + 653 : 223 figs. : 167 tables.

The first edition was intended mainly as a textbook for the beginner in India [XIX, p. 911], but in revising, an attempt has been made to make the work useful as well to postgraduate students and research workers. The subject matter has undergone rearrangements, expansion and some rewriting, more examples from investigations in India have been included, and new chapters, dealing with allelism, sex inheritance, cytoplasmic inheritance and heterosis, have been added. The glossary and lists of linkage values, gene symbols and chromosome numbers have been brought up-to-date and made more comprehensive, and the work now contains 223 illustrations as against 161 in the first edition. This new and considerably enlarged edition is however disappointing, all the more so as a first-class text book with its scope would be very useful, not only to students and research workers in India, but also in other countries with comparable agricultural problems. The criticisms of careless editing and a fair number of factual errors, applied to the first edition, cannot unfortunately be withheld from the second, which gives the general impression of having been patched up and padded, with regrettable loss of the opportunity to remedy oversimplifications, out-of-date expressions and in many cases far too uncritical an approach, as, notably, in the section dealing with the origin of crops, where only a perfunctory indication, if any, is given of controversial issues. As stated in the preface to the new edition, the work aims at preparing the student so as to be able "to appreciate the more advanced literature on this difficult subject." Certainly it will succeed to a considerable extent in accomplishing this, but as suggested in our review of the first edition, probably more benefit is to be derived from it in conjunction with formal teaching rather than by the unaided student.

5616 PADOA, E.
Storia della vita sulla Terra. (**The history of life on the earth**).
Feltrinelli Editore, Milano : 1959 : L.it. 3.500 : Pp. 338 : 95 figs. : 22 tables : 11 plates.

The first chapter of this attractive book on evolution gives a brief outline of what is supposed to have been the history of the universe, based on the assumption of an initial explosion some 5000 million years ago, and explains the principle of evolution of living organisms. Evidence for the occurrence of this evolution is presented in chapter 2, and chapter 3 outlines the types of organisms found in successive geological ages, which are all clearly defined; chapter 4 gives an exposition of modern hypotheses concerning the origin of life, placing naive beliefs in spontaneous generation, whether held by medieval scholars or present-day fanatics like Lepešinskaja, in a group together. The argument is confined to life on this planet as the author was not "in the mood", as he puts it, to discuss the possibilities as regards the moon or other planets. The hypotheses favoured are those of Haldane and Oparin [XXVIII, 3563], supported by evidence from experiments by Miller [cf. 5617].

A more detailed account of the fossil record in successive geological periods is given in chapters 5–15, the details being mainly confined to zoological objects. The causal agents of evolution are discussed in the third and last part of the book; the theory of Lamarck is explained but shown to be unproven, though phenomena of adaptation in microorganisms are referred to, as are the views of Baldwin and of Waddington on the genetical assimilation of acquired characters. Belief in predetermination or hologenesis is likened to beliefs in levitation and "telepathic revelations of poor aunty who died at Pernambuco" and the author proceeds to expound the Darwinian theory and to refute one or two objections that have been raised to it. Finally, the contributions of genetics to an understanding of the causes of the variation on which natural selection operates is explained, not omitting an outline of the principles of population genetics and the Hardy-Weinberg law. Italian readers are fortunate in having an exponent of the evolutionary principle who presents the case in such persuasive terms and in such a vivid and intimate style. A slight lapse in assembling the type on p. 56 is fairly easily disentangled.

5617 FLORKIN, M. (Editor)
Aspects of the origin of life.
Pergamon Press, Oxford 1960 : 30s. :
Pp. viii + 199 : figs. : tables : 6 plates.

The present volume comprises a selection of 20 of the articles presented to the International Symposium held in Moscow in 1957 [cf. XXIX, 908]. The first is by V. G. Fesenkov, who presents grounds for believing that the earth lost the whole of its original atmosphere and that the present one is a secondary phenomenon. Conditions for the origin of life were created by the existence of water separated by continents, which led to the enrichment of the oceans in mineral constituents. H. C. Urey also believes that the earth lost large quantities of hydrogen during its early history, before the appearance of oxygen. On Venus the temperatures are higher and water seems to be absent but the conditions are thought not to exclude the possibility of life altogether. Nor were they once on Mars, though present temperatures (30° to −70° C.) seem discouraging. A. P. Vinogradov, discussing the origin of the biosphere, supports the hypothesis of the earth evolved from cold substance, the primary atmosphere resulting from the liberation, during melting, of volatile compounds previously bound; having reached a maximum, temperature fell and after some 2–3 x 10^9 years became such as to permit the origin of life and the oxygenization of the atmosphere. J. D. Bernal suggests that carbon dioxide fixation, light-energy utilization and oxygen production may have originated separately, that synthetic processes were first catalysed by minerals and that the advent of polymers added speed and efficiency to this process; later stages are envisaged as being enclosed by lipoprotein membranes and the final stage as that of a nucleated cell. B. Yu. Levin also believes the earth to have formed from aggregation of a cold protoplanetary cloud, which already contained simple organic compounds such as CH_4 and NH_3 and more complicated hydrocarbons. N. W. Pirie doubts whether life forms based on proteins, iron or chlorine were the only ones. P. N. Kropotkin sees the first vital processes as similar to those carried out today by anaerobic bacteria and by desulphurizing petroleum bacteria; he outlines the evidence for the inorganic origin of petroleum and points out a number of inadequacies in the hypotheses that assume its biogenic origin. A. P. Terent'ev and E. I. Klabunovskiĭ discuss the role of dissymmetry in the origin of living matter, seeing circularly polarized light, present in the light reflected from the earth, as the agency responsible for the asymmetry of organic molecules. S. L. Miller reported the synthesis of various organic compounds, including aminoacids, by passing H_2, CH_4 and NH_3 over a spark discharge in the presence of water. T. E. Pavlovskaya and A. G. Pasynskiĭ also report the production of aminoacids from the action of ultraviolet rays on mixtures of formaldehyde with ammonium nitrate or ammonium chloride, on mixtures such as those used by Miller and on mixtures of CH_4, NH_3, CO and H_2O. E. I. Klabunovskiĭ gives evidence for the role of asymmetric adsorption as well as circularly polarized light in the origin of optically active compounds, citing many cases where this has been effected by inorganic catalysts such as quartz. S. Akabori presents a hypothesis for the formation of the first proteins from formaldehyde, NH_3 and HCN, giving first aminoacetonitrile followed by polymerization; this and the introduction of side chains were demonstrated experimentally. M. Calvin suggested that complex catalysts evolved from simpler ones by successive steps, finally giving autocatalysis, which being more efficient would have been selected, though the basic chemical reactions remain the same; a similar line of reasoning supposes that "the reaction sequence which is now used by green plants for the reduction of carbon dioxide was developed independently of the photosynthetic apparatus, and presumably later coupled to the energy-capturing and transforming mechanism which the photosynthetic apparatus represents". L. Pauling too sees the origin of life as starting with the first occurrence of a molecule capable of catalysing the synthesis of replicas of itself; this could lead by easy stages to DNA according to the Watson-Crick model; it is pointed out that the planarity in the amide group, and other properties of the polypeptide chains, can be predicted on the theory of resonance; folding of the polypeptide chain is seen as an important factor in determining genetic differences and hence evolution. R. L. M. Synge views the predominance of the same 20 aminoacids in the proteins of all organisms as evidence of their common descent; cases are cited where differences in one or two aminoacids in a compound like insulin are found in different phyla, though its physiological functions remain largely unchanged. S. W Fox presents data on the production of linear peptides by heating certain mixtures of aminoacids and the results are said to "suggest the appearance, in overlapping order, of reactions, protein, and nucleic acid". J. D. Bernal describes the different molecular structures that can arise from packing of particles of various sizes and shapes, suggesting that the more complex can have arisen in gradual stages from the more simple, leading finally to the globular proteins, for which not even the exact principle of packing is yet understood. A. I. Oparin presents some experimental data obtained since the publication of his book [cf. XXVIII, 3563]. Incorporation of enzymes into coacervate drops markedly reduced their rate of action but increased the proportion of the reaction products; the incorporation of labelled aminoacids into protoplasts was shown to be a process requiring very small amounts of energy but depending entirely on "the multimolecular structure" of the protoplasm; a constant amount of nucleic acids was not in itself sufficient. G. A. Deborin discusses various combinations of proteins in complex systems, each displaying a greater degree of specialized biochemical activity. C. Reid suggests the cystine molecule or some other sulphur-containing system as a component of the primitive photochemical process; experiments are reported in which the irradiation of cystine led to the formation of cysteine followed by a great array of products, including aminoacids.

Some confusion between absorption and adsorption seems to have arisen during the printing of the volume.

5618 Machlis, L. & Briggs, W. R. (Editors). **Annual review of plant physiology. Vol. 12.**
Annual Reviews, Inc., Palo Alto, California 1961 : $7.50 : Pp. vii + 502 : figs. : tables.

This year's volume [cf. XXX, 4527] starts with a prefatory chapter by A. I. Virtanen on Some aspects of amino acid synthesis in plants and related subjects. The next contribution is by F. L. Crane on Structure and function of mitochondria, attention being confined largely to plant mitochondria; we are told that "evidence begins to show that mitochondria can build themselves up and tear themselves down with abandon, and it leaves us with a rather dynamic picture of mitochondrial structure". Certain differences between plant and animal mitochondria have already been detected and more are expected. All the evidence however seems to point to the membrane as the essential part fulfilling the functions of the mitochondrion and the lipoproteins are attracting more and more attention: "life may be made possible by the stabilizing influence of a lipid phase in an aqueous medium. The biphasic system provides for the separation of reactants and an orderly sequence of reactions not possible in a uniphasic system".

G. Setterfield and S. T. Bayley write on Structure and physiology of cell walls, G. Webster on Protein synthesis and F. B. Salisbury on Photoperiodism and the flowering process; this last review shows us how the photoperiodic responses of almost all plants are influenced by temperature and other factors in addition to light; evidence is cited for the existence of a flowering hormone, though little seems to be known yet of its mode of action.

J. H. Taylor, writing on Physiology of mitosis and meiosis, gives particular attention to the events occurring during interphase; the effects of such factors as temperature, radiation, various chemical agents and nutritional factors are discussed; experiments on culture of crown-gall cells have shown some substance to be present that stimulates mitosis and may be lost if division is too rapid, though whether this substance is a virus or some other type of particle is not conclusively decided.

There are contributions on indole auxins, gibberellins and kinetin, on geotropism and on damage from air pollution and the last essay is on Physiology of wilt disease, by T. S. Sadasivan, who shows that much of the effect of resistant varieties of various crop plants is exerted through action of root exudates on the rhizosphere and it is suggested that more attention should be directed towards this aspect when breeding for resistance; most of the symptoms, which are described, are shown to be produced by the vivotoxin fusaric acid and attention should be given to the search for inhibitors in potential resistant hosts.

5619 Jucker, E. (Editor)
Fortschritte der Arzneimittelforschung. (**Progress in drug research**).
Birkhäuser Verlag, Basel and Stuttgart 1960 : **2** : sFr. 85 : Pp. 636 : figs. : tables.

The second volume of the series [cf. XXX, 945] includes a review on The structure and biogenesis of certain antibiotics, by W. A. Sexton, who tells us, among many other chemical details, that aminoacids of the d-configuration are no longer considered unnatural, since they occur in several antibiotics; in the penicillins, for instance, the d-penicillamine is known to be derived from an l-acid, with an optical inversion during the course of the biogenesis. In considering the evolutionary significance of antibiotics it is suggested that most of them are no more than metabolic waste products. Antibiotics are also included in the review Über neue Arzneimittel [On new medicinal products], by W. Kunz. In Über Vorkommen und Bedeutung der Indolstruktur in der Medizin und Biologie [On the occurrence and importance of the indole structure in medicine and biology], A. Cerletti includes a section on plants, where the auxins naturally play a predominant role but reference is also made to other such familiar products as indigo, histamine, tryptamine and various alkaloids, as well as less familiar ones such as cohoba snuff, the Mexican hallucinogenic fungus (*Psilocybe mexicana*) and 5-methoxy-N-methyltryptamine, which occurs in *Phalaris arundinacea* (misquoted in the text as *orundinacea*) and causes poisoning in sheep. Other reviews deal with new diuretics, anabolic steroids, quaternary ammonium salts, monoaminoxidase inhibitors and antimetabolites.

5620 Luck, J. M. (Editor).
Annual review of biochemistry.
Annual Reviews, Inc. Palo Alto, California 1961 : **30** : $7.50 : Pp. viii + 758 : figs. : tables.

The prefatory chapter this year [cf. 1153] is by J. H. Northrop, who writes on Biochemists, biologists and William of Occam, chiding biologists because some of them "fearlessly bolster an ailing (and unnecessary) assumption by another similar one"; in doing so he contrives to give an entertaining and stimulating review of many of the biochemical principles that have been established as the result of what often looked like fatuous controversies; the polymerase system, which can synthesize DNA by an autocatalytic reaction requiring energy, is considered to be perhaps the simplest living system; a gene is thought of as a molecule of nucleic acid, and a virus, it is suggested, may be the product of a change in its structure, i.e. a mutation.

A review by C. Levinthal and P. F. Davison is devoted to Biochemistry of genetic factors, mentioning, among other things, evidence that the DNA molecule *in vivo* is much longer than those commonly obtained in purified preparations; many of the results reviewed accord with the Watson-Crick views on DNA structure and function; the bibliography to this review cites 259 works, almost all dated 1959 or 1960.

A. Rich and D. W. Green write on X-ray studies on compounds of biological interest, giving details of some of the important contributions of recent work to an understanding of the three-dimensional structure of aminoacids, proteins and other large molecules; they reveal a close correspondence between the structure of synthetic polypeptides and naturally occurring fibrous proteins and we are told that many questions related to the synthesis and activity of the globular proteins are on the way to being answered; structures similar to DNA have been obtained from synthetic polynucleotides and have conformed happily with the Watson-Crick model; whereas ribosomal structure remains obscure, much is already known concerning several viruses, vitamin B_{12} and some of the higher carbohydrates. The structure of proteins is dealt with in a review by B. S. Harrap, W. B. Gratzer and P. Doty, who give special attention to the three-dimensional structure of myoglobin, hemoglobin and ribonuclease. P. Berg reviews Specificity in protein synthesis and W. N. Pearson and W. J. Darby, Protein nutrition.

R. Abrams reviews Nucleic acid metabolism and biosynthesis; that RNA synthesis is confined to the nucleus seems to gain in support but whether the nucleolus is solely responsible is apparently still open to doubt. There are results indicating that the inhibition of DNA synthesis by irradiation is a result of a change in the template and is independent of the effect of irradiation on mitosis. The chemistry of nucleotides is also dealt with in a review by A. M. Michelson, and other reviews deal with such subjects as the metabolism of lipids, carbohydrates and amino-acids, various types of vitamins, steroid hormones and the biochemistry of the dividing cell. A final item lists 25 other reviews of biochemical interest published in 1961 in other series of the *Annual Reviews*.

5621 Eames, A. J.
Morphology of the angiosperms.
McGraw-Hill Book Company, Inc., New York, Toronto, London 1961 : 1st Ed. : 104s. 6d. : Pp. xiii + 518 : 148 figs.

Although morphology retains its place as the necessary background for most botanical work, there have been few attempts to write adequate text books incorporating the many advances that have been made in recent years in angiosperm morphology.

Professor Eames now provides us with such a book which can confidently be described as essential to any major botanical library. The first chapter defines the fundamental morphological categories. It is followed by chapters dealing respectively with the inflorescence, flower, andrecium, pollen, gynecium, ovule, megaspore and endosperm, fertilization, and seed. The eleventh chapter breaks new ground in a morphological text book in dealing in detail with the comparative anatomy of what are commonly regarded as primitive angiosperm families, in particular the families assigned to the Ranales, Dilleniales and Helobiales. In the concluding chapter, the phylogeny of the angiosperms is considered in somewhat general terms, together with the relations of the dicotyledons and monocotyledons and the origin of the angiosperms.

Throughout the book, Professor Eames erects his morphological edifice within the scaffolding provided by "classical" morphology. The numerous divergent treatments of particular organs by different morphologists are indeed duly indicated but the impression gained is that many of these are very strict variations on a single theme. Theories that stand outside the classical tradition, such as carpel polymorphism, acarpy, the "new morphology" or the durian theory are noted though without enthusiasm.

For a botanist outside the classical tradition, the present volume provides a highly useful compendium of concrete morphological data, but fails to carry conviction at the more abstract levels of discussion. It will suffice to mention two points in this connexion. The author frequently constructs morphological series, and these are, with some confidence, equated with evolutionary trends, most frequently in the direction of reduction in complexity. To take one example: "In the elms, *Ulmus americana* has a compacted panicle; *U. thomasi*, a raceme; *U. pumila*, a head—an obvious reduction series". It is however not obvious. The earliest known fossil elms (Cretaceous) appear to be most closely related to *U. parvifolia*, with an inflorescence like *U. pumila*. Moreover, in the main centre of diversity of the genus, in China, species with shortly pedicellate clusters are frequent, as they are in such closely related genera as *Planera* and *Zelkova*. It is arguable that the primitive inflorescence in *Ulmus* was a shortly pedicellate cluster and that this evolved in two directions, towards compaction, as in *U. pumila*, and towards laxness, as in *U. americana* and *U. thomasi*. It seems preferable not to equate morphological series with evolutionary trends without much stronger accessory evidence.

The other point is more fundamental. Much of the discussion in the book appears to revolve around the allocation of organs to morphological categories, the choice between which seems to depend on something other than scientific inference. The mental process involved is usually called interpretation and though, of course, scientific inference, often of a high order, is brought into play, it, by itself, is unable to provide a definitive interpretation. The author comes near to admitting this in criticizing theories of acarpy which "can be held only if anatomical structure and early ontogeny are meaningless, and if morphology has no significance." Perhaps however, plant structure is without either meaning or significance in the sense intended in the quotation. The burden of proof is on the author.

5622 Clowes, F. A. L.
Apical meristems. Vol. 2.
Blackwell Scientific Publications, Oxford 1960 : 37s. 6d. : Pp. 217 : 42 figs. : 1 table : 32 plates.

The study of apical meristems is an exclusive preserve, or rather two exclusive preserves, since investigators of shoot apices seldom turn their attention to root apices or *vice versa*. However, the author, a root-apex specialist, has ventured to present the results of both shoot and root work and has succeeded in presenting a detailed and informative account of the subject for other sorts of botanists.

The first half of the book is concerned with shoots and the second half with roots. Angiosperms receive most attention but gymnosperms and ferns are also treated at some length. There are 32 excellent photographic plates.

Much of current understanding of apex development derives from two techniques, the spatial relations of cell lineages as seen in median longitudinal section, and the distribution of mitoses. The use of these methods is described at length.

Perhaps influenced by the philosophical mood at Oxford, the author has taken great pains to eschew all verbal issues and has succeeded in producing a book in which the ratio of fact to theory is quite unusually high. The morphologist who hopes to use the development of the apex to establish homologies will receive scant help. "There is much to be said", the author states, "for the developmental anatomist treating all organs as organs *sui generis*". The old dispute as to the foliar or cauline nature of the vascular system is also dismissed as verbal.

Controversial issues are indeed raised but these are on highly concrete points. Thus the author is unsympathetic to the view of French anatomists that the stem apex is occupied by a zone of infrequently dividing cells, the *méristème d'attente*, though he vigorously champions his own view that a *quiescent centre* is found under the root apex.

The author finds a use for the *tunica-corpus* distinction in the shoot apex first made by Schmidt in 1924; he also utilizes the much less known *Körper-Kappe* distinction in the root apex established even earlier (1917) by Schlüepp. Geneticists will find the chapter on chimeras, especially mixoploid chimeras, and the discussion of polysomaty in the root of particular interest.

5623 Molisch, H. & Höfler, K.
Anatomie der Pflanze. (**Plant anatomy**).
VEB Gustav Fischer Verlag, Jena 1961 :
7th Ed. : DM 14.20 : Pp. 172 : 185 figs.

The first edition of this well known introduction was published more than forty years ago, the sixth edition appearing in 1954 [cf. XXIV, p. 482]. The present edition remains very much like its predecessors although there are numerous additions to and modifications of the text and several new illustrations, mainly incorporating the results of electron-microscope studies. The principal additions are sections on endomitosis, chromosomes, chondriosomes, spherosomes, meiosomes, and the microfibrillar structure of the cell membrane.

5624 Park, R. D.
Crop husbandry.
Oxford University Press, London 1961 :
18s. : Pp. viii + 237 : 67 figs. : 6 tables :
plates.

Intended primarily for students in farm institutes or young persons attending part-time courses in agriculture while working on farms, *Crop Husbandry* follows fairly closely the syllabus of the appropriate examinations of the City and Guilds of London Institute. The author's approach is eminently sensible and the text is informative without being frightening.

5625 **Mechanisms in biological competition. Symposium of the Society for Experimental Biology. No. 15.**
Cambridge University Press 1961 : 50s. :
Pp. vi + 365 : figs. : tables : plates.

The fifteenth Symposium of the Society for Experimental Biology [cf. XXIX, 4703] was held at Southampton, England, in September 1960 and was devoted to problems of competition. The proceedings are reproduced in the present volume. It starts with a contribution on Approaches to the study of plant competition by J. L. Harper, who referred to experiments with *Bromus rigidus* and *B. madritensis* in pure and mixed stands in which effects of both interspecific and intraspecific competition were clearly demonstrated, though the differential between species was not increased by increasing density. The different attitudes of agronomists, ecologists, geneticists and evolutionists towards competition are illustrated.

W. T. Williams and D. A. Barber offer a contribution on The functional significance of aerenchyma in plants, suggesting that its role may be both mechanical and metabolic.

Competition between trees and herbs for nutrient elements in calcareous soil is treated by C. Olsen, who shows the absence of trees in certain glades in a calcareous forest in Denmark to be due to low contents of Fe and N rather than to the Ca itself; the tree species are unable to compete with the herbs under such conditions.

C. E. Lucas spoke interestingly On the significance of external metabolites in ecology, reviewing a wide range of symbiotic and other interrelationships between organisms, and of similar relationships between organisms and free metabolites, which are thought to have had an important role throughout evolution and, possibly, even in the origin of life. The role of toxic substances in the interrelationships between higher plants was dealt with by G. Grümmer, who referred to exudates toxic to other plants emitted by *Agropyron repens*, *Encelia farinosa*, *Juglans* spp., *Artemisia absinthium*, *Camelina alyssum* and other species. A contribution by the late A. G. Winter, on New physiological and biological aspects in the interrelationships between higher plants, deals with the same topic, mentioning some of the physiologically active substances that are introduced into the soil from the remains of growing plants or their decomposition; these include vitamins, antibiotics and alkaloids, and many of them have been shown to enter the plant through the roots.

K.-I. Sakai dealt with Competitive ability in plants: its inheritance and some related problems; reference was made to an experiment with twelve barley cultivars where their competitive ability was found to be not associated with plant height, maturity, seed size, growing habit (erect *v.* prostrate), heading habit (spring *v.* winter type) or grain yield. In another experiment with barley hybrids it was found that the hybrids with the most vigorous growth had the lowest competitive ability. The complex of characters associated with the *indica* group in *Oryza sativa* seems to be correlated with high competitive ability. Data are presented on the influence of various environmental factors on the competitive ability in rice varieties, and on its inheritance; in the example given the heritability was low, h^2 being $= 0{\cdot}1177$ when measured by panicle number and 0·0254 when measured by plant weight. In an experiment with 17 rice cultivars in Ceylon, number of panicles, straw weight and grain yield were highly correlated with one another but with seed fertility the correlation was low or even negative; some cultivars had much higher competitive ability than others but competitive ability was not correlated with response to weeding. The wild species *O. perennis* and *O. sativa* f. *spontanea* seemed to be inferior rather than superior to the cultivars in competitive ability.

K. Mather spoke on Competition and cooperation, showing how at low population densities or certain other circumstances competition may be replaced by cooperation; a case of cooperation between a cytoplasmic mutation in *Aspergillus nidulans* and nuclear genes supplying adenine is cited; absence of cooperation may lead to cancers or other disorders.

C. M. Donald, speaking on Competition for light in crops and pastures, cited, *inter alia*, data showing the effect of small differences in petiole length in determining competitive ability of subterranean clover cultivars. It is suggested that too little attention has so far been given to improving the efficiency of our crops in their use of light.

C. T. de Wit, speaking on Space relationships within populations of one or more species, referred to experiments on mixed sowings of oats and barley, in which it was shown that, although the yield of barley in monoculture is lower than the yield of oats, the proportion of barley in a mixture increases because the barley has an advantage as far as crowding for space is concerned. Mathematical expressions for the results are presented. Two grass species and peas and oats were shown to compete for space whereas *Trifolium repens* and *Lolium perenne* showed some cooperation owing to the ability of the former to use atmospheric nitrogen.

The last contribution, by F. L. Milthorpe, is on The nature and analysis of competition between plants of different species; various factors affecting competition are examined, in the course of which reference is made to some sterile hybrids between *Festuca pratensis* and *Lolium perenne* which have supplanted both parent species in a riverside meadow, apparently owing to their combining the high rate of tillering of *L. perenne* with the high regenerating capacity of *F. pratensis*.

5626 IRVINE, F. R.
Woody plants of Ghana.
Oxford University Press 1961 : 105s. :
Pp. xcv + 868 : 143 figs. : 34 plates.

A hasty glance at the title and solid appearance of this volume might lead the reader to expect a comprehensive and possibly pedestrian manual of identification and taxonomic botany. The subheading offers some reassurance that the book is of more general interest, and readers already acquainted with the author's Plants of the Gold Coast, of which this forms a revised and expanded edition, will know that they can expect a very fascinating work indeed. Plants of the Gold Coast, published in 1930, was an attempt to combine in one work systematic botanical knowledge of indigenous plants with as much information as possible on local names, on traditional uses in medicine, magic, food, clothing and construction, and on folk lore and proverbs about plants. In the time that has elapsed since the first edition, the material available for compilation of this kind has grown to such dimensions that Dr. Irvine has found it necessary in this new edition not only to confine himself to trees, shrubs and woody climbers but also to omit much of the matter on ecology, folk lore and proverbs. Even so, the volume has grown from its original size of 500-odd pages to more than 850, an expansion which has fortunately not been accompanied by any dilution of interest. The resulting large body of information of the most varied kind has been both skilfully arranged to allow ready reference and painstakingly printed so as to enable the eye to pick out easily from the page the details required by the reader.

The bulk of the work contains accounts of individual plants, varying in length from a few lines to more than two pages, the information given for each plant being: botanical name; English and African vernacular names; habitat; distribution; main morphological characteristics; and uses. The latter range from the provision of food, drink, medicines, poisons and materials for building and clothing, to less obvious uses such as fish bait and lightning conductors.

Tables, lists, appendices and indexes make up the remainder of the book. These include: an extensive list of plants arranged according to use; a tabular analysis of the nutritional value of certain food plants; a similar analysis of certain shrubs and trees used as fodder; a bibliography; glossaries of botanical, pharmacological, medical and veterinary terms; lists of English and vernacular names with the equivalent scientific names; and an index to the families and genera. To complete this handsomely produced volume, which will undoubtedly be a standard work for a long while to come, there are a group of photographs collected at the end of the book, a number of attractive coloured plates and many full-page line drawings carefully placed next to the relevant part of the text.

5627 MINISCALCO, V.
I mais ibridi. (**Hybrid maize**).
Edizioni Agricole, Bologna 1955 : L.it. 1000 : Pp. vii + 213 : 47 figs.

The first chapter of this attractive booklet gives statistics on the amounts of maize cultivated in different parts of Italy and the islands and of the yields produced. An account is given of the development of hybrid maize in the USA and in Italy. The increase in yield attributable to the use of hybrids in the year 1952, when only 8·7% of the maize sown consisted of hybrid seed, is cited as 220 thousand tons. By 1954 the production of hybrid seed in Italy was sufficient to meet local requirements and leave a surplus for export. Data for other countries are cited from statistics published by FAO. Information is given on the composition of the grain of the various types of hybrid. The addresses are given of seven organizations where hybrid seed is produced in Italy.

The second chapter explains the principles of cytogenetics, with particular reference to maize genetics, the technique of pollination devised by Boceta [cf. XXI, 277], the principles involved in producing single and double crosses and other hybrid combinations and, finally, certain newer techniques such as recurrent reciprocal selection and the use of male sterility. Readers are warned not to expect spectacular results from hybrid maize in unfavourable situations, where the local varieties often do better than the hybrids now available; these local varieties, most of them having flint grain, are hence regarded as a valuable source of germ plasm for future hybrids and promising top crosses already produced from some of them include Insubria 2201, a flint, and Insubria SDF 521, a semiflint type. A similar top-cross hybrid obtained from Argentina, FAV355, has also given good results in the region of Udine in northern Italy. In this connexion attention is drawn to the value of the method of consanguineous lines proposed by Boceta [cf. XXI, 277] for utilizing the valuable genic heritage of locally adapted varieties.

Chapters 3–5 deal with the various climatic, edaphic and cultural factors that affect the growth of maize and chapter 6 with the classification of maize types. Other chapters are concerned with seed treatment, including vernalization, manuring, methods of sowing, cultural operations and irrigation. In chapter 14, devoted to hybrid maize, reference is made to the FAO hybrid maize programme. Data are presented showing the greater yields of grain obtained from hybrids produced locally compared with hybrids of the same parentage produced in the USA or elsewhere. The system of classification and denomination used for its hybrids by the Maize Research Station at Bergamo and the FAO system of classification according to maturity period are explained and the results of the FAO experiments on the behaviour of hybrids in different localities are referred to; details are given of the parentage and characteristics of the hybrids available for growing in Italy, with illustrations of their ears and indications of the localities for which they are suited. Finally there is an account of the three worst insect pests of maize in Italy.

An appendix gives details of seed certification.

5628 Sortenratgeber Gräser und Kleearten. **(Guide to cultivars of grass and clover species).**
DLG-Verlag, Frankfurt am Main : 1961 : DM 6,20 : Pp. 76 : tables.

This useful booklet, after indexes in which the species are listed in the order of their Latin and their German names, starts with an illustrated explanation of what is meant by the various terms used to denote growth habit in the different phases of growth. The grass species are then taken one by one, in the order of their Latin names. Information is given on their growth habit, leaf form, type of inflorescence, seed characteristics and mode of utilization. The main German cultivars are then named and described, with information on their origin, date of production, registration number, characteristics and main uses. All this information is also given in tabular form; other tables show flowering times, and proportions of leaf, stem and inflorescence. There follows a section of similar information for "clover species", these being taken in a wide sense to embrace species of *Lotus*, *Medicago*, *Onobrychis* and *Ornithopus* as well as *Trifolium* spp. The booklet is completed by a list of breeders, giving addresses and the cultivars they have produced.

5629 **Research techniques in use at the Grassland Research Institute, Hurley.**
Bull. Commonw. Bur. Pastures Field Crops 1961 : No. 45 : 40s. : Pp. viii + 166 : 17 figs. : 5 tables : 28 plates.

As explained in the foreword, the idea of preparing this publication developed as a result of numerous enquiries for details of techniques, experimental methods, apparatus and equipment in use at the Grassland Research Institute. These details have been incorporated in the present bulletin in a series of 26 chapters written by members of the staff, with the hope that the volume will be found useful to a wide range of agronomists and to other agricultural research workers. It is also hoped that investigators elsewhere may be saved the time-absorbing exercise and some of the tedium of developing fresh techniques for measuring the output of grassland and grazing animals. It is emphasized that the only classes of stock now used in experiments at the institute are (1) beef steers, from calf to fat beast, and (2) sheep, namely ewes and lambs, ewe lambs in the year before breeding and, for digestibility trials or as plot grazers, castrated males. The chapters are grouped into six parts: I, Experimental design and interpretation; II, Herbage plant investigations; III, Animal investigations; IV, Plant soil studies; V, Extension trials; and VI, Special laboratory equipment and its use. One appendix lists the names of the contributors, another gives a list of the proprietary products referred to in the text and a third a conversion table. A list of the literature cited and short glossary are included. Nearly 30 photographs, placed together, complete the bulletin.

5630 Kundu, B. C., Basak, K. C. & Sarcar, P. B.
Jute in India.
Indian Central Jute Committee, Calcutta 1959 : 30s. : Pp. 395 : 74 figs. : tables.

Published by the Indian Central Jute Committee, this monograph is divided into three sections devoted, respectively, to agriculture, economic and marketing problems, and science and technology. In the first section, an introductory chapter which includes a description of the two cultivated jute species, *Corchorus capsularis* and *C. olitorius*, is followed by 11 chapters dealing respectively with breeding, genetics, cytogenetics, anatomy, physiology, soils and climate, cultivation, quality of jute, seed production, diseases and pests. The chapter on breeding includes details of improved varieties which have been developed since the beginning of the century. The chapters on genetics and cytogenetics together comprise only eighteen pages, clearly indicating the need for fundamental research in this important genus. The importance of the jute crop in the Indian economy is demonstrated by the detailed treatment of the economic and technological aspects of jute production. The book has a large number of photographs, mostly of poor quality, and no index.

NEW JOURNALS

Agrobotanika, Tápiószele.

Agrobotanika is the official organ of the Országos Agrobotanikai Intézet (National Institute of Agricultural Botany) at Tápiószele, Hungary, whose work is concerned with the "collection, maintenance, systematic classification and morphological, botanical, physiological, biochemical and phytopathological testing of Hungarian and world varieties of crop plants." The first volume appeared in 1959 and contained articles on experimental lay-out, the wheat collection at Tápiószele, a sweet corn variety trial and a study of fruit form in red pepper.

Further information may be obtained from the institute.

Bulletin of the Faculty of Agriculture, Tamagawa University.

The Faculty of Agriculture of Tamagawa University, Tokyo, is publishing an annual bulletin, the first of which contains three articles on biometrical breeding methods, by S. Kataoka, K. Sakai and Y. Yukura, respectively, summarized in the present number of *Plant Breeding Abstracts.* The articles are in Japanese or English, the former with English summaries. Enquiries should be addressed to the Dean, Faculty of Agriculture, Tamagawa University, Machida-shi, Tokyo.

Genetica polonica.

Genetica polonica is a journal devoted to genetics and plant breeding in Poland. It is to contain only articles on original work, most of which are to appear in English, with Polish summaries. The first number contains articles on lupin species, varieties and hybrids and on the systematics of the Genisteae, all of which are reviewed in this number of *Plant Breeding Abstracts.* The technical editor is K. Stodolak, Zakład Genetyki Roślin PAN, Poznań 29, ul. Wojska Polskiego 71c, Poland.

Pakistan Journal of Biological and Agricultural Sciences.

The above journal is published quarterly by the Pakistan Society for Biological and Agricultural Sciences. Further information may be obtained from the Society's secretary, Dr. K. Ahmad, Department of Biochemistry, University of Dacca, East Pakistan.

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